THE INFLUENCE OF PEDAGOGICAL CONTENT KNOWLEDGE ON AP PSYCHOLOGY TEACHERS' CLASSROOM INSTRUCTION

By

Michael A. Kopish

A dissertation submitted in partial fulfillment of the requirements for the degree of

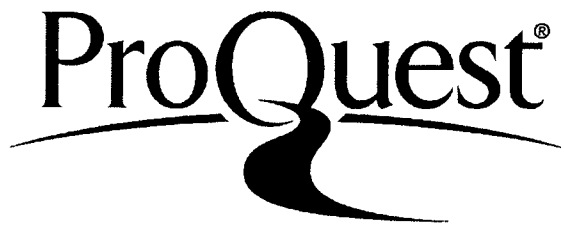
Doctor of Philosophy

(Curriculum and Instruction)

at the

UNIVERSITY OF WISCONSIN-MADISON

2011



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Date of final oral examination: June 29, 2011

Month and year degree to be awarded: August 2011

The dissertation is approved by the following members of the Final Oral Committee:

Alan L. Lockwood, Professor, Curriculum and Instruction
Diana E. Hess, Professor, Curriculum and Instruction
Gary G. Price, Professor, Curriculum and Instruction
Simone A. Schweber, Associate Professor, Curriculum and Instruction
Peter M. Miller, Assistant Professor, Education Leadership and Policy Analysis

Abstract

This study seeks to understand the ways AP Psychology teachers' pedagogical content knowledge (PCK) affects instruction and contributes to student understanding in a challenging and exemplar unit of the AP Psychology curriculum. Data sources include interviews, observations, and document analysis of professionally recommended teachers (n=5) and pre- and post-test scores of students' (n=112) on AP-style augmented exams. Within and between units of instruction, teachers documented professional and pedagogical experiences related to content area knowledge, instructional practice, and decisions that teachers' actually made when teaching. Findings demonstrate students achieved higher scores on post-tests in classes where teachers: demonstrated a greater repertoire of approaches and components for instruction; represented content in multiple forms for students; and engaged students in content-specific activities during in-class instruction. Teachers' ability to represent content and transform knowledge for students during instruction is an integral and perhaps the most critical component of PCK for AP Psychology teachers.

Dedicated to my beloved Jessica

Acknowledgements

I would like to thank my committee for their support and assistance. They provided guidance in all areas that helped me accomplish my goals. Alan Lockwood, thank you for your mentorship throughout my education; your belief and support kept me on target throughout the process. Diana Hess, thank you for teaching me the process of research and encouraging me to share my work to a broader audience. Gary Price, thank you for asking thoughtful questions and encouraging me to think from alternative perspectives. Simone Schweber, thank you for your thoughtful contributions and encouragement to respond clearly and confidently. Peter Miller, thank you for graciously giving your time and comments when it was most needed; you are a tremendous inspiration to become a better writer.

I would like to thank all of the AP Psychology teachers and students for their participation in the study. They were a dedicated group of teachers whose quest to provide high quality education for their students was inspiring.

I also want to thank my colleagues who have freely contributed their time and feedback to assist in completing this project. Casey and Taehan, your keen eyes and thought-provoking questions moved this research beyond a work in progress.

To my beloved dogs, Moody and Emma, thank you for providing the necessary distractions to keep me grounded.

A special thanks goes to a great friend who shared this experience from afar. Doc Mitchell, you planted a seed long ago to become a teacher and professor. Throughout the years, your support, motivation, and laughter brought me over the finish line.

I also wish to genuinely thank my parents and grandparents for their unwavering support of my educational pursuits. You instilled the fundamental parts of my education: values, work ethic, and unconditional love, for which I am deeply appreciative.

Finally, I want to thank my beautiful fiancée and soon-to-be wife in the fall of 2012, Jessica. Every moment together is more decided and remarkable. On this occasion, "You must allow me to tell you how ardently I admire and love you."

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Chapter One: Introduction

The following section is organized to provide background of the study including: statement of the problem, purpose of the study, research questions, importance of the study, definition of terms, and limitations.

Statement of Problem - Purpose of the Study

As a former high school and community college psychology teacher, I have always been interested in the teaching of psychology and the various instructional practices teachers employ to make psychology content alive and relevant for students. The impetus for this study originated from a critique offered by the Chief Reader for the Free Response portion of the AP Psychology Exam. Here, the Reader addresses a specific content area that is challenging for teachers to teach and students to learn in the state of Wisconsin:

> "There did not appear to be any specific research concept that scored inappropriately low, but a lack of mastery of research concepts overall suggests that the nature of content coverage can be challenging for high school teachers..." (College Board, 2008a, p. 67).

Clearly stated, the problem manifests in two ways; one, students lack mastery of research concepts and two, content coverage can be challenging for high school teachers. In order to address these problems, I began by analyzing available data from the College Board.

The APA Education Directorate (2003) estimated over 360,000 students enrolled in a high school psychology course. In 2009, over 129,000 high school students from across the nation took the AP Psychology Exam and is the third most-taken AP Exam in the state of Wisconsin (College Board, 2009). The following year, in 2010, participation data released by the College Board showed the AP Psychology Exam was the most-taken by Exam by seniors in Wisconsin, which surpassed AP History and AP Biology for the first time (College Board,

2010a). These trends highlight the increasing participation and popularity of the psychology course in high schools generally and AP Psychology in Wisconsin specifically. In addition to being a popular course and exam, students in the state of Wisconsin have traditionally performed well on the AP Psychology Exam (see Table 1).

Table 1 – Total AP Psychology Exam Participation WI

AP Psychology Test Year	Total AP Psychology Tests Taken in WI	Total AP Psychology Tests with 3+ score	Percentage Passing
2009	5385	4335	80.5%
2008	5156	3895	75.54%
2007	4497	3475	77.27%
2006	4230	3325	78.61%
2005	3323	2631	79.18%
2004	964	813	84.34%

Starting in 1997, the College Board began releasing the AP Report to the Nation. Contained in the documents are national and state by state student achievement data from each Exam subject. As part of the review of research, a series of t-tests were conducted to compare the mean AP Psychology Exam scores for all students in the state of Wisconsin to mean Exam scores for all students in the nation for each of the years of released data. Every year, with the exception of 1998, mean AP Psychology Exam test scores from students in the state of Wisconsin were significantly different (+) than the national average (see Table 2).

Table 2 – Wisconsin AP Psychology Exam Scores Compared to the National Average

Year	N	WI Mean, SD	National Mean, SD	t-score	p<*.05 p< **.01
1997	976	3.33; 1.40	3.25; 1.21	1.78	*
1998	1163	3.22; .89	3.19; 1.27	1.14	NS
1999	1287	3.38; 1.32	3.18; 1.38	5.43	**
2000	1646	3.49; 1.33	3.23; 1.27	7.92	**

2001	1876	3.30; 1.35	3.07; 1.26	7.35	**
2002	2001	3.61; 1.26	3.32; 1.28	10.33	**
2003	2399	3.51; 1.33	3.22; 1.30	10.62	**
2004	3030	3.57; 1.36	3.29; 1.31	11.35	**
2005	3323	3.50; 1.50	3.13; 1.39	14.18	**
2006	4230	3.50; 1.52	3.37; 1.40	6.70	**
2007	4497	3.45; 1.57	3.08; 1.41	15.81	**
2008	5156	3.37; 1.59	3.12; 1.40	11.26	**

The number of students who take the AP Psychology Exam has increased every year since the Exam's inception in 1992 and is one of the most popular AP Exams among high school students in Wisconsin. Additionally, a high percentage of students in Wisconsin score a three or higher on the AP Psychology Exam which makes them eligible for college credit. From these data, one may gather that the teachers of AP Psychology are very effective in teaching the essential knowledge and skills necessary for their students to be successful on the AP Psychology Exam.

These findings sparked further interest and curiosity. Teachers and students struggled with the Research Methods unit; yet, as a whole, were incredibly successful on the AP Psychology Exam. Beyond a preliminary analysis of data made available through the College Board, there was a paucity of research to explain the historical success of students on the AP Psychology Exam, Why are students in Wisconsin successful on the AP Psychology Exam? In fact, a literature base of research that identifies the effects of psychology (and AP Psychology) curriculum and instruction on learning outcomes is noticeably deficient along this trajectory and appears minimally in education and social studies juried journals. To date, the high school

psychology (and AP Psychology) course remains one of the least researched courses in the pre-college curriculum (NCSS, 1991).

Overall, students in the state of Wisconsin perform well on the AP Psychology Exam; however, the Chief Reader's commentary on Wisconsin students' performance on the Free Response Questions of the AP Psychology Exam highlights the Methods Domain as a source of difficulty for teachers and students:

> The central importance of research methods virtually guarantees that a substantial number of questions on future AP Psychology Exams will deal with them. That does not mean that every year there will be a research question, but it behooves teachers to ensure that students do not get shortchanged in the time and processes invested in this important area. There did not appear to be any specific research concept that scored inappropriately low, but a lack of mastery of research concepts overall suggests that the nature of content coverage can be challenging for high school teachers because even those with the best skills and intentions might elect to leave out a concept that could end up on the AP Exam. (College Board, 2008a, p. 67).

The commentary was a lever of intrigue and provided me a direction of focus as findings from previous research on high school psychology showed teachers lacked content knowledge with respect to: experimental psychology, research methods, and statistics. In sum, the studies conclusions lamented that high school psychology instruction was not covering such content adequately.

Based on the Chief Reader's commentary that content coverage can be challenging to teachers and the description of what teachers are being asked to teach, I decided to identify the content students are to know from the Research Methods unit for the AP Psychology Exam by looking at the 2004 Released Exam and Free Response Essay (FRE) questions from 2002-2009. I created a list of 32 vocabulary words from a recommended AP Psychology textbook (Myers, 2009) in the Research Methods chapter and was intrigued by my findings. On the 2004 Released AP Psychology Exam, 11 of the 100 questions were focused specifically on content

from the Research Methods Domain in either the questions or answers; highest frequency counts included: "standard deviation" - 4, "correlation" - 3, "test" - 2, "bias" – 2, "case study" - 2. On the Free Response Essay questions, I found content from the Research Methods domain in one of the two questions from 2003, 2004, 2005, 2006, and 2008. Virtually every year content from the Research Methods domain appeared in the Free Response Essay section of the Exam; application of the terms "correlation" and "validity" appeared most frequently on questions, each in two different years.

In sum, the presentation of these data indicate that: students in Wisconsin lack a mastery of research concepts despite high levels of achievement on the AP Psychology Exam; teaching the content in the Research Methods domain is particularly challenging for teachers, the content within the Research Methods domain is of central importance to the understanding of psychology, and frequently appear as multiple choice and free response test questions on the AP Psychology Exam. However, the nature of content coverage that can be challenging for teachers from the Research Methods domain of the AP Psychology curriculum is not addressed in research in a clear or coherent manner. Thus, this dissertation seeks to compare AP Psychology teachers' instructional practices in the Research Methods unit with a 'Preferred' unit of the AP Psychology curriculum. Specifically, through the conceptual lens of pedagogical content knowledge (Shulman, 1987; Grossman, 1990; Magnusson et. al, 1999; Grossman et. al, 2005; Hashweh, 2005), I identify what teachers need to know and be able to do well with respect to student learning and understanding in the domain of Research Methods in AP Psychology.

Questions Guiding the Study

Main Research Questions:

1. **How do different categories of knowledge interact to form the AP Psychology teachers' pedagogical content knowledge?**
2. **What are the critical attributes of AP Psychology teachers' pedagogical content knowledge that guided the participants' instruction of the Research Methods and 'Preferred' units of the AP Psychology curriculum?**
3. **To what extent do the instructional practices of AP Psychology teachers contribute to student learning of the content in the Research Methods and 'Preferred' units of the AP Psychology curriculum?**

Why the Research is Important?

The examination of multiple aspects of pedagogical content knowledge through the employment of in-depth interviews, classroom observation of teaching, and statistical analysis of student outcomes on an augmented AP Psychology Exam will add knowledge of pedagogical content knowledge's influence on decision-making and practice in the real world context of AP Psychology curriculum and assessment. This study allows for better anticipation of the needs of teachers in AP Psychology education; to better understand the specialized knowledge, skills, and expertise of AP Psychology teachers by making the tacit and elusive explicit for all audiences. One implication of this research includes the possibility for AP Psychology teachers' professional development of what teachers need to know and be able to do. Two, the research is helpful in informing teachers about ways of considering the nature of AP Psychology teaching and learning. Three, the study is meant to be informative and insightful, potentially acting as a catalyst for engaging AP Psychology teachers in new ways.

Definition of Terms

In order to clarify the purpose, research questions, and research context, this study incorporates the use of the following definitions for the constructs central to this study.

Pedagogical Content Knowledge (PCK) – Original – Pedagogical content knowledge include teachers' "ways of representing and formulating the subject matter that makes it comprehensible to others." (Shulman, 1986, p. 9).

Pedagogical Content Knowledge (PCK) - Modified - "Pedagogical content knowledge is the set or repertoire of private and personal content-specific general event-based as well as story-based pedagogical constructions that the experienced teacher has developed as a result of repeated planning and teaching of, and reflection on the teaching of, the most regularly taught topics" (Hashweh, 2005, p. 277).

Pedagogical Content Knowledge – Applied - A way of representing the complex interaction between teachers' understandings of content and pedagogy and the influence on classroom instruction

"Orientations to Teaching AP Psychology" - Component of pedagogical content knowledge that refers to the academic and professional training and experiences that influenced the development of teachers' knowledge and beliefs for teaching (Grossman et. al, 1989; Hashweh, 2005).

"Knowledge of AP Psychology Curriculum" - Component of pedagogical content knowledge that refers to the nature and dimensions of internal and external curricular goals and objectives for the classroom setting (Grossman, 1990; Magnusson et. al, 1999).

"Knowledge of Students' Understanding of AP Psychology" - Component of pedagogical content knowledge that refers to knowledge teachers must have about students in order to help them develop specific AP Psychology knowledge (Grossman, 1990; Magnusson et. al, 1999; Grossman et. al, 2005; Hashweh, 2005).

"Knowledge of Instructional Strategies for Teaching AP Psychology" - Component of pedagogical content knowledge that refers to instances of how knowledge is transformed and represented during instruction to promote student understanding by focusing on teachers' content representations, professional and pedagogical repertoires, and knowledge transformation in teaching difficult topic-specific subject-matter (Grossman et. al, 2005; Hashweh, 2005).

"Knowledge of Assessment in AP Psychology" - Component of pedagogical content knowledge that refers to the aspects of student learning that important to assess and the ways that might be employed by teachers to assess students (Magnusson et. al, 1999)

Advanced Placement (AP) - College Board courses and exams developed collaboratively by scholars and teachers.

Instruction - "Anything that is done purposely to facilitate learning" (Reigeluth and Carr-Chellman, 2009, p. 6).

Instructional Approaches - Instructional approaches "set a general direction or trajectory for the instruction and are comprised of more precise or detailed components (Reigeluth and Keller, 2009, p. 31).

Instructional Components - Instructional components are selected by the practitioner depending on the situation and often in concert with other smaller, more precise, micro-strategies (Reigeluth and Keller, 2009).

Definition of Terms for **Instructional Approaches** (Reigeluth and Keller, 2009, p. 30-35)

Direct Instruction - An instructional method that draws on carefully scripted instruction intended to promote efficient learning.

Discovery-based learning - A broad method in which instruction is organized around a process of helping learners to discover a pre-determined model, concept, or proposition.

Drill and practice - A method focused on rote learning and automatization through the repeated presentation of prompts and corrective feedback.

Expository teaching - Instruction depending primarily on teacher lecture. [syn: didactic, teacher-centered]

Hands-on learning - A method focused on learner involvement in discovery of principles and the mastery of skills or ideas through activity and direct experience – learning by doing.

Inquiry-based instruction - A method in which instruction is organized by the interests of the students. Students are encouraged to ask questions and the learning is centered upon answering those questions.

Instructional game - A method in which the knowledge, skills, and abilities that are the focus of the instruction are acquired through a game devised for that purpose.

Instructional simulation - Instruction that simulates the critical elements of a real-life context to approximate the complexity surrounding the skill to be learned or the understanding to be gained.

Problem-based learning/instruction - Instruction that is organized around helping students to achieve or arrive at the solution to a problem.

Project-based learning/instruction - Instruction organized around making a product, task, or service.

Role play - A method in which key ideas and skills are illustrated or practiced by learners assuming roles and contexts in which the ideas and skills would typically be applied.

Teacher-centered instruction - An instructional approach in which the teacher is the primary delivery channel for instructional content – often through presentation and lecture. (syn: expository, didactic, transmission-oriented)

Definition of Terms for **Instructional Components** (Reigeluth and Keller, 2009, p. 30-35)

Advance organizer - A component method used at the beginning of an instructional sequence to help "bridge" the gap between what the learner knows and what she will be learning and doing.

Analogies - A component method that draws comparisons between something familiar and something unfamiliar for the purpose of learning or understanding the latter.

Authentic tasks - A component method that is used for its similarity to the real world and for its motivational appeal to the learner.

Collaborative work - A method that capitalizes on the learning advantages that come from learners working together to solve a problem or accomplish a task. [syn: cooperative work]

Cooperative work - This method provides structures for completing work or products by dividing work among group members. Cooperative work is chosen because bigger projects can be tackled and completed by groups working collectively. [syn: collaborative work]

Demonstration - A basic component method in which an instructor demonstrates to learners how to do or make something. This method is often followed by a student trial of the same skill. [model]

Elaboration - Expanding from a simple instance of a concept or skill to a more complex or nuanced instance to aid the learner's full grasp of the content.

Examples/Nonexamples - The use of instances of a concept that illustrate key attributes of the concept in contrast with instances that do not illustrate the key attributes of the concept, to aid the learner in discrimination regarding salient characteristics or dimensions of the concept.

Feedback - A component method that provides the student with information about the quality of the performance and specific guidance about the correct and incorrect aspects of the performance.

Guided practice - A method involving the learner's practice of a skill, with supervision and assistance from the teacher as needed.

Independent practice - A method involving the learner's practice of a skill without supervision or assistance from the teacher.

Peer tutoring - A technique in which a peer of the learner helps him or her to grasp ideas and concepts through close mentoring and feedback.

Practice - A component method involving repetitive interaction of learning with content.

Preview - A technique often used at the onset of instruction to establish instructional targets and raise the interest of the learner by some technique that allows the learner to glimpse what the instructional experience will be like.

Reciprocal teaching - Instruction that utilizes a pair of students or a small group to act as teachers for each other, thus requiring each student to bear some responsibility for helping the others to learn the content.

Review - A summarizing method that draws together the main points of a learning experience to reinforce the grasp of key concepts.

Self-assessment - A component that guides students to reflect upon and compare their work to a standard.

Team work - A collaborative method that promotes learning through the accomplishment of an activity, project, or task as a group of learners.

Limitations and Delimitations

Limitations

This study is limited:

1. To one instructional unit (Research Methods) selected by the investigator based on the literature review and one instructional unit identified by the teacher as their 'Preferred' unit.
2. By the investigator's modest experience conducting multi-methods research.
3. To the investigation of PCK within the confines of two instructional units.
4. To the examination of PCK within the confines of three interviews (60-90 minutes) with experienced, successful AP Psychology teachers.
5. To the ways of accessing teachers' PCK via individual interviews, document analysis, and direct observation of four lessons performed by teachers.
6. To the sensitivity of the data which were collected on site as well the transcriptions from audio-taped interviews due to the teachers' performance and ability to account the rationale behind their practices,
7. To the determination PCK based on teachers' practices, interview protocol and the affect on student performance on a 20-question augmented AP Psychology Exams.

Delimitations

The study is delimited to:

1. The specific observation methods introduced in chapter four.
2. The nature of qualitative findings could be subject to other interpretations.
3. The teaching of a specific subject matter (i.e., research methods, social psychology, learning, biopsychology, and development) taught by the teachers to AP Psychology students.
4. Students at school sites were predominantly homogeneous with respect to race and SES.
5. Teachers were considered effective based on recommendations from AP Psychology professional development personnel, principals, and the pass rate of 85% from previous AP Psychology Exams.

Chapter Two: Review of Literature

Studies of High School Psychology

The general arc of research in the study of psychology at the secondary level was focused on gathering data from survey research on teacher characteristics, academic preparation of teachers, curriculum and objectives of high school psychology courses (Engle, 1952, 1967; Abrams and Stanley, 1967; Ryan, 1974; Anderson, 1965; McFadden and Pasewark, 1970; Noland, 1967; Epley and Schwerin, 1977; Wertheimer, 1973; Ragland, 1992). Through analysis of the large-scale survey data, the researchers' intent was to recommend policy changes as indicated by the arguments rendered in the closing sections of the studies. Recommendations from researchers followed a persuasive and analogous trajectory; the most common advocated for better academic training in psychology for teachers with an emphasis on strengthening teacher content knowledge and training in methods that were unique to psychology instruction. In addition, the studies petitioned for a shift in content instruction from a humanistic orientation of psychology to one more scientific discipline of study and ultimately, the creation of Advanced Placement Psychology.

Teacher Training

Historically, teachers of psychology have had limited training in psychology and were often certified in a subject or discipline that was not psychology (Stone and Watson, 1937; Engle, 1952, 1967; Abrams and Stanley, 1967; Ryan, 1974; Anderson, 1965; McFadden and Pasewark, 1970; Noland, 1967; Epley and Schwerin, 1977; Wertheimer, 1973; Ragland, 1992). In Ragland's (1992) study in particular, she discovered half of teachers majored in history rather than psychology, most teachers taught other subjects a majority of the time, and most (62%) of teachers had not taken a social studies methods course. All of the aforementioned studies

wielded major criticism against high school teachers of psychology for a lack of academic preparation from college courses in the field of psychology and deficient content knowledge.

According to survey data from Ryan (1974), teachers indicated high levels of coursework completed in psychology courses that were more humanistic (i.e., psychology tests, social, adjustment, mental health) compared to the lowest levels of coursework completed in scientific-oriented courses (i.e., stats, physiological, comparative, sensation, perception). In spite of the lack of formal training in all levels of psychology, teachers suggested summer institutes were a good way to get background knowledge in psychology. Ryan (1974) recommended the APA and its affiliates develop more summer institutes for teachers. Specifically, he suggested a need for psychology teachers to acquire more empirical methods and science logic, more specific psychology teacher instruction in schools of education, and the need for teacher training in demonstrations, class and individual student exercises, projects, and activities.

Abrams and Stanley (1967) also expressed concerns over the training of psychology teachers and absence of quality psychology education at the high school level. The authors found a small minority of institutions offered undergraduate teaching majors in psychology and less than 1 in 100 offered a methods course in the teaching of psychology for prospective high school psychology teachers. While acknowledging that institutional change during the time was slow, the authors suggested the reason why institutions did not invest time and resources to prepare students to teach high school psychology was due to the imposition created by state certification requirements and lack of high school psychology. In order to move more quickly, Abrams and Stanley (1967) recommended "retreading" already certified teachers with summer institutes and work toward the creation of Advanced Placement Psychology in order to introduce psychology as a scientific discipline and firm up the subject base for prospective teachers (p. 4).

Epley and Schwerin (1977) discussed a need for teachers to have greater formal training in psychology before teaching. Because most instructors were isolated at their schools, as the only psychology instructor, the authors identified the need for better communication between professors and high school educators. Several studies recommended strengthening the connection between teachers in the field and university departments, summer institutes for teacher training, in-service opportunities for teachers with professional psychologists, and called on the APA to play a more decisive role in training teachers with programs of interest and value (Engle, 1952, 1967; Abrams and Stanley, 1967; Ryan, 1974; Anderson, 1965; McFadden and Pasewark, 1970; Noland, 1967; Epley and Schwerin, 1977; Wertheimer, 1973; Ragland, 1992).

A summary of the concerns addressed in these studies echoed findings from the APA Committee to Study Problems Connected with the Teaching of Psychology in High Schools and Junior Colleges which warned "it seems likely that prevailing practice is to have psychology taught incidentally, by persons who do not know psychology" (Stone and Watson, 1937, p. 669). The persistent trends in the training of teachers of psychology led some to conclude that prior to a discussion of *what* should be taught in psychology, a conversation of *who* should be teaching should take place by addressing the "paradoxical relationship between need on the one hand and a lack of competent instruction on the other" (Schell,1967, p. 191).

To address these issues, the APA and other affiliated organizations increased their level of involvement through the preparation of curriculum, resources, and materials, in addition to the organization of teaching and learning outcomes. The goal of the involvement was to provide teacher development in content and instruction specific to psychology, particularly in the more scientific-oriented areas of psychology. However, to my knowledge, clear and coherent research that identifies the extent to which these efforts were effective is not addressed in the literature.

Curriculum – Subject Matter Stressed

Findings from a series of studies demonstrated a pattern of content coverage in high school psychology courses that researchers attributed to teachers' lack of content knowledge and academic preparation. The subject matter most often stressed at the high school level included: individuality, social behavior, development, and mental health compared to the least stressed: sensation/perception, biological and physiological, and statistics (Breland, 1978). In another study, Engle (1967) asked high school psychology teachers to rank the subjects covered in their classes; individuality was the subject covered most and statistics least in their classes. Ryan (1974) found the content most taught was personality-oriented (i.e., personality, learning, mental health, emotion, and conditioning) compared to scientifically-oriented content which was least taught (i.e., research methods, physiological processes, sensory processes, measurement and statistics). Over time, research on high school psychology teachers has demonstrated a consistent trajectory of emphasis. Instruction traditionally focused on a personality-development orientation with course objectives on self knowledge, self understanding, concepts and theories, and the development of social and interpersonal skills (Ragland (1992).

Curricular Resources

In terms of curricular material used in schools, Engle (1956) revealed that textbooks devoted less space to biological foundations of behavior, learning, and statistics than introductory college textbooks. Instead, the high school textbooks devoted space to personality, personal problems, and mental health.

High School Psychology Students

Research that provides information on high school psychology students is limited; however, a few broad findings emerged. In general, psychology courses are elective social studies courses and students have traditionally been high school juniors and seniors in a college preparatory track (Engle, 1958; Anderson, 1965; Breland, 1978; Snellgrove, 1973 cited in Rolson and Medway, 1982; White, Marcuella, and Oresick, 1979; Parrott and Setz, 1970). Through survey research conducted more recently, Ragland (1992) demonstrated students had a high level of interest in psychology and made demands for personal counseling and therapy for the problems they faced.

Teaching and Learning

Ragland (1992) conducted research to identify instructional strategies used by high school psychology teachers. Her findings indicate teachers employed the following instructional strategies with the greatest frequency: lecture and discussion, use of audio/visuals, inquiry, and experiments/demonstrations. Other research focused on the study of teaching and learning through the development of frameworks for an entire psychology course curriculum employed in high school psychology classrooms (Trow, 1967; Mosher and Sprinthall, 1970; Ross, 1972; Medway and Elkin, 1975).

Through an exploration of the research on teaching high school psychology, two basic approaches emerged. One approach was discipline-centered, a scientific-approach aimed at preparing students for college courses and a second approach, with a humanistic focus on personal adjustment, was designed to be relevant and practical to a broad spectrum of students (Goldman, 1983; Kasschau and Werheimer, 1974). Examples of research that explored the teaching of psychology with a humanistic focus included: personal development (Mosher and

Sprinthall, 1970; Sprinthall and Erickson, 1974); seminar practicum format (Erickson, 1977); and affective education (Goldman, 1983). Findings from a variety of related studies indicated: minimal change or growth, rare instances of statistically significant changes, no statistically significant changes, or some of all three on different dependent measures (e.g. Graff and Beggs, 1974; Hoffman, 1975; Rappaport and Sorenson, 1971; Rustad and Rogers, 1975; Sprinthall, 1980). These findings were corroborated by Kasschau and Wertheimer (1974) and Rest (1977) who indicated using an approach of teaching psychology that encourages students' personal adjustment and development has not furnished evidence to suggest an impact.

Studies of teaching and learning in high school psychology are inherently limited in scope; little is known on what interventions contribute to student achievement. For example, research on teaching particular concepts and principles, use of particular teaching methods, or of teaching specific content or materials as part of a discipline-centered or scientific-oriented course is absent in the literature for teaching high school psychology. Most of the research on classroom instruction in psychology was conducted and explored in introductory psychology courses at the college-level.

College-level Psychology Instruction

As demonstrated in the previous sections, there is a paucity of research on high school psychology. However, several studies of college-level psychology instruction have described an instructional strategy as a treatment or intervention used to teach psychology with student achievement as the outcome measure. I conducted a summary investigation for my preliminary examination in which I located and analyzed twenty-nine total articles between the years 2000 and 2008. A wide variety of instructional strategies were used and tested in college-level psychology courses throughout the United States. Overall, the instructional strategies used fit

into the following categories: instructor feedback on tests (Wininger, 2005; Landrum, 2007); cooperative learning (Harton, Richardson, Barreras, Rockloff, Latane, 2002; Skidmore and Aagaard, 2004; Saville, Zinn, Elliott, 2005); writing activities (Drabick, Weisberg, Paul, and Bubier, 2007; Fleming, 2002); changes in instructor presentation (Bartlett and Strough, 2003; Yoder and Hochevar, 2005, Harp and Maslich, 2005); elaboration techniques for vocabulary (Balch, 2005); use of study guides (Dickson, Miller, Devoley, 2005); and use of technology (Austin, Lee, and Carr, 2004; Katayama, Shambaugh, and Doctor, 2005; Poirier and Feldman, 2005; Pemberton, Borrego, and Cohen, 2006; Lawson, Bodle, McDonough, 2007; Pettijohn II and Pettijohn, 2007; Stowell and Nelson, 2007). Thus, for purposes of gaining a better understanding of teaching and learning psychology, college-level studies provided a more substantive literature base. It was to the college-level where I again turned for literature on teaching research methods for review.

Teaching Research Methods in Psychology

Historically, teachers placed little emphasis on the content of the research methods units in part because teachers had little training and it was difficult for teachers to teach. Students tend to be more receptive to learning concepts of research by actually participating in the activity of research (Goodwin, 2002). Jamison (2006), a high school teacher of IB psychology, used discovery projects to examine new topics and suggests "students do not understand the strengths and limitations of experimentation until they design and run their own" because "students do not differentiate between different methodologies until each is attempted" (p. vii).

Several innovations from teachers at the college-level have also focused on learning research through active participation in a research project. For example, students were engaged in individual projects in the third course in a sequence of four research-oriented

courses in a psychology department (Smith, 2002). Chapdelaine and Chapman (1999) used two instructors, teaching and lab assistants, and personnel from a community agency to supervise research involving their entire class in a single community-based research project. Students positively indicated on 5-point measures of learning enhancement, interest in and employment of research, and the utility of the project. Preceded by a generic statistics experience from the mathematics faculty, Marek, Christopher, and Walker (2004) involved their students in a research methods assignment with a single theme (i.e., the academic ethic, religious orientation and materialistic values, procrastination, Protestant work ethic, and personality) using an active learning approach. Students rated positively on a course evaluation the effectiveness of the project as it related to the course objectives. Sciutto (2002) used a portfolio assignment to encourage the continuity in students' methods and statistics experience with subsequent research experience. The goal of the assignment was to actively integrate material from the course and give students a personalized and accessible tool for future research endeavors. Students were able to use the portfolio on the final exam; independent ratings of the students' portfolios were positively moderately correlated with final exam scores.

Generally, the themes of actively getting students engaged in the research process and making the learning relevant emerged from a review of articles that specifically focused on the teaching of research methods. Addressed briefly, several other examples of teaching research methods, with a statistical focus, that promoted active learning and made content relevant to students emerged: the use of statistical and research applications in assessing products advertised by different companies (Beins, 1985); the intentional integration of statistics throughout the semester and empirically-based solutions to potential challenges faced by the instructor (Conners, Mccown, & Roskos-Ewoldsen, 1998); a course designed for students to use statistical concepts as tools for social reasoning within simulations of real-world problems

(Derry, Levin, & Schauble, 1995); teaching statistics conceptually and relevant to student experience (Dillbeck, 1983); use of student created questionnaires to teach procedures and techniques of statistical analysis (Thompson, 1994); a description of the problem method adapted from law and business for teaching research methods (Mc Burney, 1995); classroom exercises that promote active learning using students' body and space to illustrate statistical concepts (Connor, 2003).

Studies of Advanced Placement

From 2002-2007 the College Board funded several studies to begin to identify effective teacher practices utilized by AP teachers and to offer professional development to support those practices. In 2002, baseline descriptive data were collected from 32,109 AP teachers to identify characteristics specific to teacher training, experience and attitudes to develop a profile of AP teachers (Milweski and Gillie, 2002). A second study compared the teaching practices of AP Biology and US History teachers (Paek, Ponte, Sigel, Braun, and Powers, 2005). A third study emerged from the comparison of teaching practices and sought to identify the association between AP teacher practices and student performance on the AP Biology and US History Exams (Paek, Braun, Trapani, Pointe, and Powers, 2007). The fourth and final study investigated the effects of a problem-based learning approach to instruction on student achievement on the AP U.S. Government and Politics Exam and a Complex Scenario Deep Learning performance assessment (Mosborg, Parker, Bransford, and Vye, 2010). Collectively, these studies of AP teachers help to foster a better understanding of teacher characteristics, practices, effects on student achievement, and depth of understanding.

Characteristics of AP Teachers

In the Milweski and Gillie (2002) study, forty survey questions were developed and organized around classroom characteristics, teacher background, professional development, training and resource needs, technology, and important issues for AP teachers. Compared to other high school classes, the average AP class size is 16.9 students (22 for AP Psychology). AP teachers utilize textbooks and the blackboard as the instructional materials used most frequently. For a majority of teachers, students gained entry into AP classes based on measures of rank and percentage including: faculty recommendations (58.8%) or successful completion of a combination of prerequisite courses (53.3%) while nearly a third (34.1%) of schools had open enrollment policies for students. Teachers cited college credit (39%) as the main reason students took AP courses.

AP teachers responded to questions about their academic and professional background. A large percentage of teachers reported having a BA (82.3%), Master's degree (69.7%), and permanent certification status (81.1%). Over sixty percent (62.3%) of teachers taught one AP class per year and less than eight percent taught three or more classes. By gender, the teachers were equally divided (50%) although by race, the group of teachers was overwhelmingly white.

In terms of professional development, the teachers reported strong participation in a variety of activities within the last five years. Almost three-quarters (72.4%) of teachers participated in an AP-sponsored workshop and under half (44.9%) reported participating in an AP Summer Institute. The most popular professional development activities that large majorities of teachers reported participating in were reviewing the AP course description book (93.4%), released AP Exams (92.5%), and AP teacher manuals (89.9%). Less than twenty

percent of teachers reported taking a university course in their AP discipline (19%) or participating in an AP reading (14.9%).

AP teachers also conveyed aspects of professional development for which further training or additional resources were needed. Teachers reported needing better training in preparing students for the AP Exam, accurately assessing student performance and proficiency levels during an AP course, and learning alternative methods for presenting specific content of skills. The critical training needs reported by teachers included: covering the course content in the time available, and integrating new technologies into their AP teaching. A variety of resource needs were also mentioned by teachers. For example, teachers reported needing access to up-to-date materials, quality readings, graphics for classroom instruction, and other relevant curricular materials. More importantly, teachers reported a critical need for resources specific to AP assessment including Exam essay topics and scoring rubrics.

Technology usage for professional purposes was also reported on by teachers. Nearly forty percent (39.9%) reported using the internet at least once a week for classroom instruction. Most of what was obtained by teachers through the internet was supplemental materials for classroom instruction. For example, teachers reported doing research for class (57.7%) or getting materials to use with students (54.9%) while a low percentage indicated using the internet to acquire lesson plans (19.3%).

The researchers asked teachers to rate the importance of twelve issues related to teaching high school students. In order of importance, the teachers designated keeping up with changing discipline content, new teaching methods in the discipline, preparing students for the assessments, lack of family involvement and access to good professional development as the top five issues of importance.

AP Teachers' Practices

The *Characteristics* study was followed up by a study to indentify effective teacher practices in AP Biology and AP US History (Paek, Ponte, Sigel, Braun, and Powers, 2005). First, the researchers identified dimensions of expertise and training, school context, and classroom context as factors that affect teachers' practices. Similar to the major findings from the *Characteristics* study (Milweski and Gillie, 2002), AP Biology and AP US History teachers reported reviewing released AP Exams, course descriptions, and the teachers' guide as the most common professional development activities. These teachers also reported AP essay topics and scoring rubrics as the resources with the greatest influence on their instruction. The most critical training need for AP Biology and AP US History teachers was how to cover the course content in the time available.

In both samples of teachers, they reported volunteering to teach their respective AP courses and the largest percentage of teachers indicated they teach one class per year. Additionally, both samples reported working in schools with adequate facilities and supplies and having a wide degree of autonomy in selecting the content for their AP course and in their teaching techniques. There were some notable differences between AP Biology and AP US History teachers' school contexts. AP Biology teachers typically had 20 or fewer students (71%) compared to the largest percentage of US History teachers who indicated having between 21-30 students in class (38%). Most (66%) of AP US History teachers reported teaching on a 30-60 minute schedule compared to AP Biology (52%). However, a larger percentage of AP Biology teachers (35%) reported teaching on a 61-110 minute schedule than AP US History teachers (10%). Among other key differences between the two samples, most AP Biology courses had special procedures or criteria for enrollment (prerequisites or achievement in prior

courses) compared to AP US History. In addition, most of the students who took the AP Biology Exam were seniors (51%) compared to mostly juniors (84%) who took the AP US History Exam.

Second, the researchers analyzed aspects of teachers' instructional and assessment practices, content coverage, and test-specific instructional activities and practices. In terms of instructional and assessment practices, there were striking similarity between the two samples of teachers. Both samples of teachers indicated "understanding" as the main objective. "Lecture" was reported as the most common instructional methods by both samples of teachers and independent research projects were less commonly implement in the classroom. Teachers tended to make more use of strategies that they felt helped them cover the material in the most efficient way. For example, lectures and use of multiple choice tests were implemented because they were deemed as "effective" in helping students pass the AP Exam. However, some teachers felt that the use of these practices limited their teaching and were not aligned with current visions of how students learn. Although differentiated strategies were key in promoting useful and lasting learning, the amount of material to cover and the demands posed by the exam prevented teachers from employing strategies as often as they would have liked.

Covering the content in the time available was a concern addressed by both groups of teachers. However, AP Biology and AP US History teachers approached covering the content in very different ways; AP Biology focused on depth of coverage and AP US History focused on breadth of coverage. Both groups felt "overloaded" by the AP curriculum and were critical of the quality of teaching and learning as a result. For example, teachers reported AP seems to promote: a shallow view of the subject matter, teaching and learning strategies that do not align well with current visions of effective teaching and learning, and an unrealistic expectations and workloads on teachers and students.

At a date in May assigned by the College Board, students from all AP subjects take their respective AP Exam. While some schools have mandates that students who enroll must take the Exam, other schools encourage students to take the Exam. To prepare students for the test date in May, teachers not only have to find an efficient way to cover the course content, they also have to involve students in test preparation. Multiple-choice tests were the most frequently employed means of assessment and feedback was typically provided to students through numerical or letter grades. In addition to a strong focus on the multiple-choice portion of the AP Exam, teachers also had students prepare for the free response portions of the Exam. The most common method teachers reported in preparing students for the Exam is to have student engage in independent study, though many report using practice tests too.

The Relationship of AP Teacher Practices and Student AP Exam Performance

Building off of the major findings from *Teacher Practices* study (Paek, et. al, 2005), a new group of researchers investigated the relationship between teacher practices and student AP Exam Performance in AP Biology and AP US History (Paek, Braun, Trapini, Point, and Powers, 2007). The researchers carried out a series of exploratory unweighted regression analyses using the general liner models (GLM) methodology. In the model, the independent variables were organized by the following AP teacher practices: substantive expertise and training, school context, classroom context, instructional and assessment practices, content coverage, and test-specific instructional activities and practices (Paek, et. al, 2005) and the dependent variable was the score on the respective AP Exam.

The results of the analysis of teacher-practice variables seemed to support the notion that teacher practices are more important than context in producing better class performance. In other words, the results suggest that teachers do have an impact on student achievement. It

should be noted however, that several teaching context variables were found to be significant in the model. For example, in AP US History classes, the influence of resources proved to be incredibly important indicators of success on the Exam. Specifically, the adequacy of school resources and percentage of students who take the Exam were significant across models. For AP Biology, class size and schedule were significant in the models. AP Biology teachers seemed to attend better to smaller classes that meet daily. Across both groups, teacher participation in various forms of professional development was consistently significant. Two additional findings are noteworthy: students in schools where classes met every day performed better than those with block or compressed schedules; and, classes where more students took the exam tended to perform better.

Teacher practices had a stronger effect when the criterion for achievement is stringent. For instance, there was an association among more teacher practice variables for students who earned a four or higher on the Exam compared to those who only earned a three. Of particular interest is the association between higher Exam scores and the types of assessments and student activities used by AP Biology and US History teachers. In AP Biology, two assessments and one student activity was associated with higher scores. Specifically, students scored higher on the AP Biology Exam in classes where teachers employed assessments such as, requiring lab notebooks or journals and student presentations. Additionally, the student activity of designing-conducting an AP Biology research project seemed to have an effect on higher student Exam scores. In AP US History, no assessment-related variables were associated with higher scores. However, student activities such as developing hypotheses/arguments and the discussion of controversial events/themes were associated with high AP US History Exam scores.

Project-Based Learning in AP U.S. Government and Politics

In a recent study by Mosborg, Parker, Bransford, and Vye (2010), the researchers developed a conceptual framework for an AP U.S. Government and Politics course as an alternative approach for instruction. Students taught under a problem-based learning approach were compared to students taught through traditional forms of AP instruction (lecture/textbook reading/test prep). Specifically, the researchers identified the six topics listed in the AP U.S. Government and Politics curriculum and devised a project-based learning and learning cycle approach to instruction at three high schools (n=314). In the course, projects were developed as the "spine of the course" (p. 4) and depth of understanding was facilitated through a process of looping whereby students were taught in a traditional AP mode (textbook/lecture/test prep) and through authentic engagement in complex projects with real-world goals. Thus, the cycle of learning was inverted as students engaged in project work *prior* to reading a textbook chapter or listening to a lecture. In total, there were five project cycles - four were simulations that involved role-taking and one that involved no role-taking. In addition, two other features were prominent in the design. One, teachers were co-designers in the curriculum development; and two, another aim of the research was to provide a framework that could be adapted by other teachers to carry out instruction.

Student learning and engagement was measured by the College Board-administered AP U.S. Government and Politics Exam and a Complex Scenario Deep Learning performance assessment created by the researchers. In the Complex Scenario test, students were placed in the role of advisor in a scenario wherein they had to draft and action plan and justify recommendations for a "congressperson." The scenarios centered on controversial issues made up from current news headlines.

There were several notable findings from the study. One, students in the problem-based learning class scored significantly higher on the AP Exam than students taught in more traditional AP modes of instruction (lecture, textbook reading, test prep). In fact, 75% of the problem-based learning students achieved a passing score on the Exam compared to 51% of traditionally taught students. Two, students in the problem-based learning class scored significantly higher on all dimensions of the Complex Scenario test compared to students from traditionally taught classrooms. In other words, the findings from the second measure suggest problem-based learning students "more deeply understood the AP content to the point that they were able to apply it to solve a complex problem" (p. 10). In sum, the results of the study demonstrate the efficacy of implementing a coordinated approach of project-based learning and curriculum coverage in an Advance Placement course. This study highlights the effects of a quality learning experience for students through collaborative work, role-taking/playing, and public discourse - the central features of the five projects - as the foundation for building students' transferable, conceptual understanding and inquiry skills.

Advanced Placement Psychology

Advanced Placement Psychology is considered to be the gold standard of pre-college level psychology. Throughout the 1970s and 80s, the APA approached the College Board about adding psychology to the list of AP subjects in its program. Multiple studies contributed evidence that high school psychology courses were largely based on personal adjustment and did not bear a resemblance to the scientifically oriented course in the college preparation track (Dambrot & Popplestone, 1975; Federici and Schuerger, 1976; Griggs, Jackson, and Meyer, 1989). However, after twenty years of lobbying, the College Board granted approval for psychology as an AP subject and the first exam was administered in 1992. The course was designed, in part, to refocus the teaching of psychology from a social to more scientific study of

psychological content and to give greater credence to the subject of psychology in the schools. With the exception of a dissertation by Calderwood (2007), which investigated the effects of traditional versus learning-style instructional strategies on the topics of Pavlov's classical conditioning and Skinner's operant conditioning, studies of teaching and learning in Advanced Placement Psychology are limited.

High-Stakes Tests

High-stakes tests are those whose results are critical for students and or institutions (Madaus, 1988). Most often, high-stakes tests are standardized tests with a multiple-choice format that result in certification, classification, or selection of students and as measures of accountability. AP Exams are both multiple-choice and free response in format, and students who pass their respective Exam have the potential to earn equivalent college credit for the course. Although participation in AP Exams is voluntary, they are one-shot, high-stakes assessments on which important decisions are based. There is great pressure on AP teachers to spend time before an exam administering practice tests and reviewing concepts with students so that they have the opportunity to become familiar with the layout of the exam and its general substance (Milweski and Gillie, 2002; Paek, et. al, 2005, Paek, et. al, 2007).

Popham (2001) argues high-stakes testing results in teachers narrowing the curriculum by spending great amounts of instructional time on what is to be covered on the test rather than what is important through the implementation of tedious drill and skill activities. The pervasive view of high stakes testing suggests teachers are narrowing their curricula to include only content listed in the curriculum framework and what is tested on the examination (Brown 1992; Corbett and Wilson 1991; Darling-Hammond and Wise 1985; Grant 1997; Grant et al. 2002; McNeil 2000; Romberg, Zarinnia, and Williams 1989; Smith 1991; Smith et al. 1989; Vogler

2005, 2006a). As a result, high stakes testing alters teacher practices; the pressure of high-stakes tests tend to increase the dependency on teacher-centered instructional practices (i.e., lecture) and the superficial coverage of content driven by the textbooks (Gayler 2005; Jones, Jones, and Hargrove 2003; McNeil 2000; Rex and Nelson 2004; Vogler 2005, 2006a). High stakes testing has served as a catalyst to move away from more student-centered classroom instructional methods such as discussion, role play, inquiry, and cooperative learning. Specifically in social studies, high stakes tests were causing some teachers to alter their instructional style to less student-centered, more lecture-based, textbook style teaching (Fickel, 2006; Segall, 2006; Smith, A. M., 2006; van Hover, 2006; van Hover & Heinecke, 2005). As Ross (2000) points out, "The dominant pattern of classroom social studies pedagogy is characterized by text-oriented, whole group, teacher-centered instruction, with an emphasis on memorization of factual information" (p. 47).

The focus of teachers' instruction is to "teach to the test" by incorporating explicit instruction of test-taking skills into their teaching (Amrein and Berliner, 2002a, 2002b; McNeil 2000; Pedulla et. al. 2003). As a consequence, students are subjected to instruction that incorporates tedious drill and practice where students learn low cognitive-level information in the most time-efficient manner (Adler, Dougan, and Garcia 2006; Evans 2004; Hargrove et al. 2000; Jones, Jones, and Hargrove 2003; McNeil 2000). Teachers' instructional practices have been altered by the pressures associated with high-stakes testing. In the classroom this translates into teachers preparing students for tests with pedagogies that focus on rote memorization and lower-order thinking as the tests themselves are usually structured to assess breadth of often shallow, fragmented bits of knowledge (see, e.g., Gayler, 2005; McNeil, 2000; Stecher & Barron, 2001; Taylor, Shepard, Kinner, & Rosenthal, 2001).

Chapter Three: Theoretical Framework

Pedagogical Content Knowledge

Early Conceptions of PCK

A dominant strand in teacher effectiveness research stems from the work of Shulman (1986, 1987) who introduced the phrase *pedagogical content knowledge* and sparked a new wave of scholarly research on teachers' knowledge of subject matter and the importance of this knowledge for successful teaching. Of interest to Shulman were the aspects that make subject matter teachable to others; thus, PCK is "the ways of representing and formulating the subject matter that makes it comprehensible to others" (Shulman, 1986, p.9). PCK included teacher representations of the subject matter, students' current knowledge about the subject they bring with them to an educational setting, in addition to conceptions and misconceptions about the content that made teaching and learning easy or difficult (Shulman, 1986).

An early version of PCK was postulated by Shulman (1986) as a category of teacher knowledge along with content knowledge and curricular knowledge (see Figure 1 below). Content knowledge referred to the teachers' organization and breadth of knowledge about the subject matter. Curricular knowledge was represented by a range of topics planned and sequenced for teaching a specific subject matter at a given level. This planning and sequencing of content included the selection of appropriate instructional materials in relation to the topics of the curricular plan, within a particular discipline or subject matter.

Figure 1 – Teachers' knowledge base categories according to Shulman (1986)

Teacher Knowledge Base (Shulman, 1986)		
Content Knowledge	**Pedagogical Content Knowledge (PCK)**	Curricular Knowledge

A year after the initial proposal of PCK, Shulman (1987) expanded the teacher knowledge base categories to include four new categories in addition to content knowledge, pedagogical content knowledge and curricular knowledge (see Figure 2 below). The first category of teachers' knowledge, included strategies and practices for classroom management and organization, what he referred to as: general pedagogical knowledge. The second category, knowledge of the learners and their characteristics emerged as a separate knowledge base category from Shulman's (1986) original proposition to now focus on students' conceptions and misconceptions about the subject matter. The third category focused on knowledge of contexts of schooling which included familiarity with the classroom and school district to the practices of the community and local culture. The last category highlighted teachers' educational goals, philosophy, beliefs and values.

Figure 2 – Teachers' knowledge base categories according to Shulman (1987)

Teacher Knowledge Base (Shulman, 1987)						
Content Knowledge	**Pedagogical Content Knowledge**	Curricular Knowledge	General Pedagogical Knowledge	Knowledge of Learners	Context of Schooling	Knowledge of Educational Ends

From a theoretical perspective, rather than distinguishing PCK from the other categories of teacher knowledge, PCK was argued to derive from other types of knowledge. Pedagogical content knowledge (PCK) was therefore refined to be viewed as "the blending of content and

pedagogy into an understanding of how particular topics, problems or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction" (Shulman, 1987, p. 8). Shulman (1986, 1987) argued that "blending" was necessary to transform the content and pedagogy via selected teacher actions to diverse learners. In other words, there was not one single way to represent the content to the student; acts of teaching represent the transformation of knowledge from the teacher to the student should be considered as PCK.

Despite the theoretical refinement of PCK by Shulman (1986, 1987), there was still a lack of clarity as to what PCK is. This lack of clarity left room for additional contributions; working from Shulman's (1987) postulation that PCK is derived from categories of teacher knowledge, Gudmundsdottir and Shulman (1987) and Marks (1990) worked to further clarify PCK (see Figure 3). Consequently, PCK was now believed to derive from a teacher's content knowledge, general pedagogical knowledge and knowledge of learners or previous PCK experiences. The first category argued PCK derived from the teachers' subject matter knowledge of main topics and areas of a particular subject or discipline (Gudmundsdottir and Shulman, 1987) and the interpretation and transformation of content knowledge into pedagogical content knowledge for instruction (Marks, 1990). PCK also derived from general pedagogical knowledge, an area that referred to the use of demonstrations, simulations, and questioning strategies to explain a concept to the learners (Gudmundsdottir and Shulman, 1987; Marks, 1990) that is enacted in particular or specific contexts (Marks, 1990). Aspects of the third category of PCK differed between Gudmundsdottir and Shulman (1987) and Marks (1990). According to Shulman (1986) and Gudmundsdottir and Shulman (1987), PCK was influence by a teachers' knowledge of students; specifically students' conceptions or misconceptions of topics. Alternatively, Marks (1990) argued the PCK derived from previous PCK or the

enactment of learning activities, teaching strategies, and awareness of students' lack of subject matter knowledge.

Figure 3 – Areas of knowledge that influence PCK (Gudmundsdottir & Shulman, 1987; Marks, 1990)

Pedagogical Content Knowledge (Gudmundsdottir & Shulman, 1987; Marks, 1990)		
PCK derived from Content Knowledge	PCK derived from General Pedagogical Knowledge (PCK)	PCK derived from Knowledge of Learners or Previous PCK Experiences

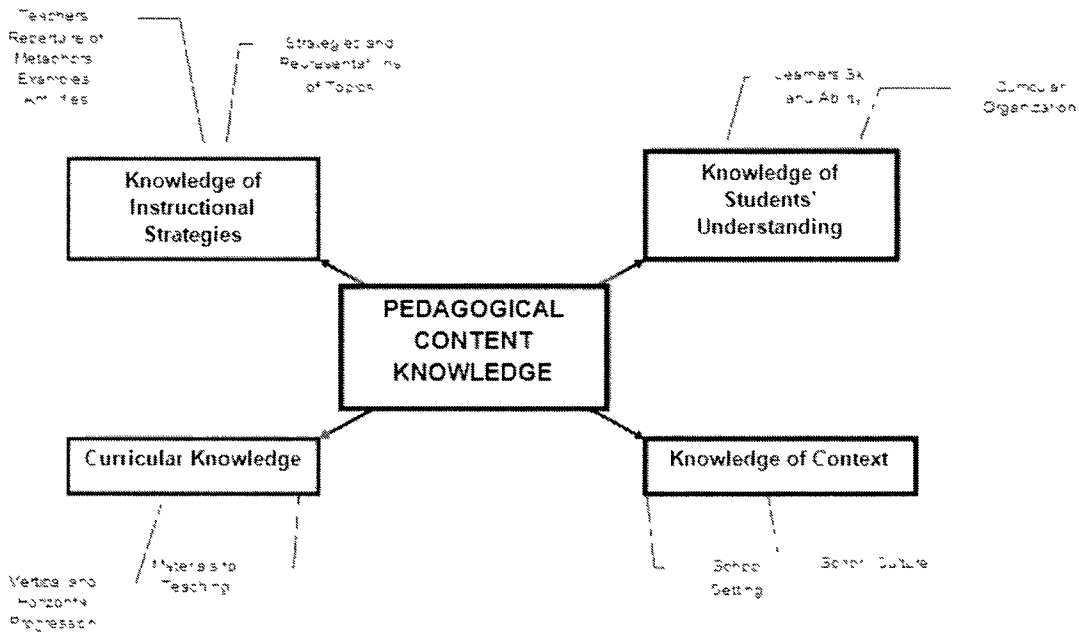
Changes in PCK

In a shift from Shulman's (1987) original conception of PCK, Grossman (1990) argued PCK had four central components: conceptions and purposes for teaching subject matter, knowledge of students' understanding, curricular knowledge, and knowledge of instructional strategies. This conception of PCK differed from Shulman (1987) in that Grossman (1990) noted the categories were interactive rather than isolated.

For Grossman (1990), PCK included knowledge and conceptions about the purpose of teaching at different grade levels (see Figure 4). The teachers' conceptions of the purposes of teaching were reflected in her goals for teaching the subject matter and the likely structuring of the curriculum. The component of knowledge of students' understanding was identical to Shulman (1986), Gudmundsdottir and Shulman (1987), and Marks (1990). This category referred to the teachers' knowledge of what the students already know about the subject matter, their skills and abilities, and what they still find puzzling about the content (Grossman, 1990). For Grossman (1990), curricular knowledge pertained to knowledge about curricular materials that may be used to teach particular content and about vertical and horizontal curricula progressions for a topic. As part of curricular knowledge, the teacher draws upon knowledge of

what the students already learned, and on what they are likely to learn in the future. Knowledge of instructional strategies included teaching strategies and representations in specific topics. Grossman (1990) referred in this category to teachers' repertoire of metaphors, examples, and activities that are particularly effective for teaching a particular topic. In terms of knowledge of context, Grossman (1990) referred to teachers' understanding of the context in which they teach and the adaptation of their knowledge to the setting and the individuals they teach which is informed by: the school district, the school setting, the expectations, culture, and departmental guidelines that might impact teaching.

Figure 4 – Diagram of PCK Based on Grossman (1990)

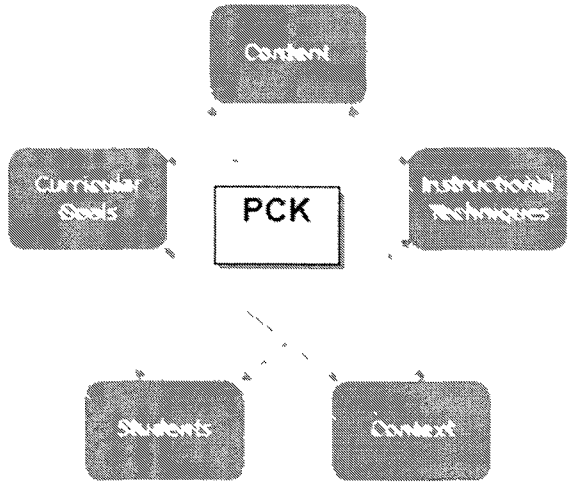


Conceptions of PCK in Research

Based on interpretations of the initial work of Shulman (1986, 1987), researchers have adapted the notion of PCK to represent the interaction of different categories of teachers' knowledge in include: knowledge of students, knowledge of subject matter, knowledge of

curricular goals, knowledge of instructional techniques and materials, and knowledge of context for learning (Fernandez-Balboa and Stiehl, 1995; Grossman, 1990; Gudmundsdottir, 1991; Loughran, et. al., 2004; Marks, 1990; Meijer, et. al., 1999; Rovegno, 1994; van Driel, et. al., 1998; Hashweh, 2005). Below, Figure 5 diagrams the interaction of knowledge categories of PCK as described in subsequent interpretations of Shulman (1986, 1987).

Figure 5 – Diagram of the Interaction of Knowledge Categories of PCK



The first category, knowledge of students, designated the means through which teachers gain knowledge about their students. This category referred to the teachers' knowledge of what the students already know about the subject matter, their skills and abilities, and what they still find puzzling about the content (Grossman, 1990). PCK included teachers' knowledge and conceptions about the purpose of teaching at different grade levels and teachers' conceptions are reflected in the goals for teaching the subject matter and the structuring of the curriculum (Shulman, 1986; Gudmundsdottir and Shulman, 1987; Marks, 1990). In application, knowledge of students illustrated decisions that teachers' make with and for instruction are greatly affected by teachers' knowledge of individual students (Grossman, 1990; Meijer, et. al., 1999) as well as

knowledge of how students' learn (Grossman, 1990; Loughran et. al., 2004; Meijer, et. al., 1999).

Knowledge of subject matter referred to the ways teachers' developed knowledge about teaching the content of particular units of instruction. Teachers' knowledge of subject matter is a result of subject area understanding that included the "nature, form, organization, and content of teacher knowledge" (Grossman, et. al., 1989, p. 25-26). Teachers' subject area understandings were referred to as knowing "that" about the concepts they are teaching (Rovegno, 1994). Knowledge of subject matter also included knowledge of the substantive and syntactic structures of a discipline (Schwab, 1964). According to Hashweh (2005), substantive knowledge is comprised of knowledge of concepts, principles, relations, topics; higher-order principles or conceptual schemes; approaches or different ways of relating topics to other disciplines while syntactic knowledge consists of a deep understanding of the processes of inquiry, evidence, and proof within a discipline.

Knowledge of curricular goals referred to the nature and dimension of internal and external goals for the classroom setting. Teachers' knowledge of goals and objectives for students in the subjects they are teaching as well as the articulation of those goals across grade levels was a key component of PCK that affected instruction (Magnusson et. al., 1999). For example, teachers' curricular goals affected how they presented material to students (Fernandez-Balboa & Stiehl, 1995). PCK also included knowledge and conceptions about the teachers' conceptions of the purposes of teaching as reflected in her goals for teaching the subject matter and the likely structuring of the curriculum. (Grossman, 1990).

Knowledge of instructional techniques and materials referred to the use of appropriate methods of instruction and resources for the particular grade-level and subject matter. For

some researchers, this component of PCK included the use of demonstrations, simulations, and questioning strategies to explain a concept to the learners (Gudmundsdottir and Shulman,1987; Marks,1990). This component has been shown to affect instructional decisions of teachers' knowledge of general pedagogical instructional techniques (Morine-Dershimer & Kent, 1999) and knowledge of subject-specific instructional techniques (Fernandez-Balboa & Stiehl, 1995; Loughran et. al., 2004; van Driel, 1998). For example, teachers' instructional decisions were affected by their knowledge of when to employ topic or subject specific instructional techniques in s study of secondary reading/English teachers (Grossman, 1990; Meijer, et. al., 1999).

Knowledge of context refers to the general school environment and particular settings in which instruction occurs. Hashweh (2005) suggested teachers' knowledge of context includes an understanding of the local educational system, community, and particular students. Contextual factors such as class size and administrative support (Fernandez-Balboa & Stiehl, 1995; Rovegno, 1994) have been shown to affect classroom instruction. Grossman (1990) found that teachers who worked with students in college preparatory classes versus general English classes approached their students and their lesson planning differently.

Recent Iterations of PCK

Although the term pedagogical content knowledge is commonplace in teacher-education literature (Bullough, 2001; Segall, 2004), PCK is complex and difficult to capture (Loughran et. al., 2004; Morine-Dershimer & Kent, 1999; van Driel, et. al. 1998). One reason for the difficulty of capturing the nature of PCK is that it is dependent on the degree to which teachers have expertise in understanding a given subject area (Grossman, 1990; Meijer, et. al., 1999). As a result, conceptions of PCK have adapted over time now and are now considered an amalgam of pedagogical knowledge and the teacher's approach to and delivery of the subject matter

(Loughran, Milroy, Berry, Gumstone, & Mulhall, 2001). Despite the adaptations of PCK, there are benefits of striving for representation of PCK as explicated by Loughran et. al. (2004):

> "Representation of PCK is to help teachers recognize, articulate, and develop their understanding of content, then clearly it must be based on an understanding of what it is about the content that the teacher knows (and has come to understand) to purposefully shape the pedagogy and the associated approach to student learning" (p. 377-378).

Over the last twenty years, the conceptualization of PCK has narrowed from holistic representations of teacher knowledge in many categories, to focus on its application in particular ways in specific contexts (Loughran et al., 2001; van Driel et al., 1998; Hashweh, 2005). In other words, PCK reflects what teachers in specific disciplines and contexts should know, be able to do, and do well in order for all students to learn. For example, Grossman, Schoenfeld, and Lee (2005) explained that PCK refers, among other things, to the teachers' ability to anticipate students' understanding or misunderstanding within the subject matter, to respond to diverse learners, and to address their understanding or misunderstanding by providing examples and various representations of the content that make the concept being taught more accessible to students. Grossman et. al. (2005) called for the uncovering of PCK by the utilization of questions "that lie at the heart of PCK – what it means to understand one's subject matter for the purpose of teaching it to others" (p. 207). The authors argue that PCK is mostly influenced by a teachers' understanding of the subject matter and the teachers' knowledge of the students and their ability to deal with students misunderstanding (Grossman et. al, 2005). This conceptualization of PCK from Grossman et. al (2005) differs from her 1990 description in the shift in emphasis to aforementioned attributes and less emphasis on curricular knowledge and knowledge of instructional strategies as components of PCK.

In another example of PCK, Hashweh (2005) suggests teachers' PCK develops over time as a repertoire of teacher pedagogical constructions (TPC) which describe instances of interactions between and among different knowledge categories.

> "Pedagogical content knowledge is the set or repertoire of private and personal content-specific general event-based as well as story-based pedagogical constructions that the experienced teacher has developed as a result of repeated planning and teaching of, and reflection on the teaching of, the most regularly taught topics (p. 277).

Thus, teachers' PCK evolves through a process of teacher pedagogical constructions (TPC), the instances of interactions between and among different knowledge categories. According to this perspective, categories of teacher knowledge interact to create a "conceptual ecology" (Strike and Posner, 1992) of teachers' practices at a certain point in time. Over time, PCK is a collection of teacher pedagogical constructions - the cases of repeated experiences of teaching a familiar topic. For example, through experience, a teacher may develop a repertoire for representing content and transforming knowledge of topic-specific subject matter in a variety of ways that interact with their knowledge of student difficulties and misconceptions.

Hashweh's (2005) argument is supported by the research of Loughran et al. (2001). In this study, data collected from science teachers through interview and reflective responses represented teachers' knowledge of content on the human circulatory system which helped to frame teachers' content representations and professional and pedagogical experience. Through interviews, teachers explained how they represented complex content area knowledge of the human circulatory system to diverse learners. In addition to demonstrating subject area knowledge, teachers' explicated curricular goals, student knowledge, instructional techniques, and assessments. Reflective responses from teachers documented professional and pedagogical experiences related to content area knowledge, instructional practice, and decisions that teachers' actually made when teaching.

Taken together, Grossman et. al. (2005) and Hashweh (2005) demonstrate new ways of understanding teachers' topic-specific subject-matter knowledge, how knowledge is transformed and represented during instruction to promote student understanding by focusing on teachers' content representations, professional and pedagogical repertoires, and knowledge transformation in teaching difficult topic-specific subject-matter. Thus, PCK, when used as a conceptual framework in research, "represents a category of teacher knowledge that is the essence of an expert teacher; provides a framework that can be used to describe the origin of this critical teacher knowledge; and, is a constructivist process and therefore a continually changing body of knowledge" (Miller, 2007, p. 91).

In this study, PCK is a way of representing the complex interaction between teachers' understandings of content and pedagogy and the influence on classroom instruction. This research began with an analysis of the current literature on high school psychology, Advanced Placement, and high stakes testing through the contributions of Shulman (1987), Grossman (1990), Magnusson et. al (1999), Grossman et. al (2005), and Hashweh (2005) to develop a working theory for collecting and analyzing data from five teachers and represent the central components of PCK for AP Psychology teachers.

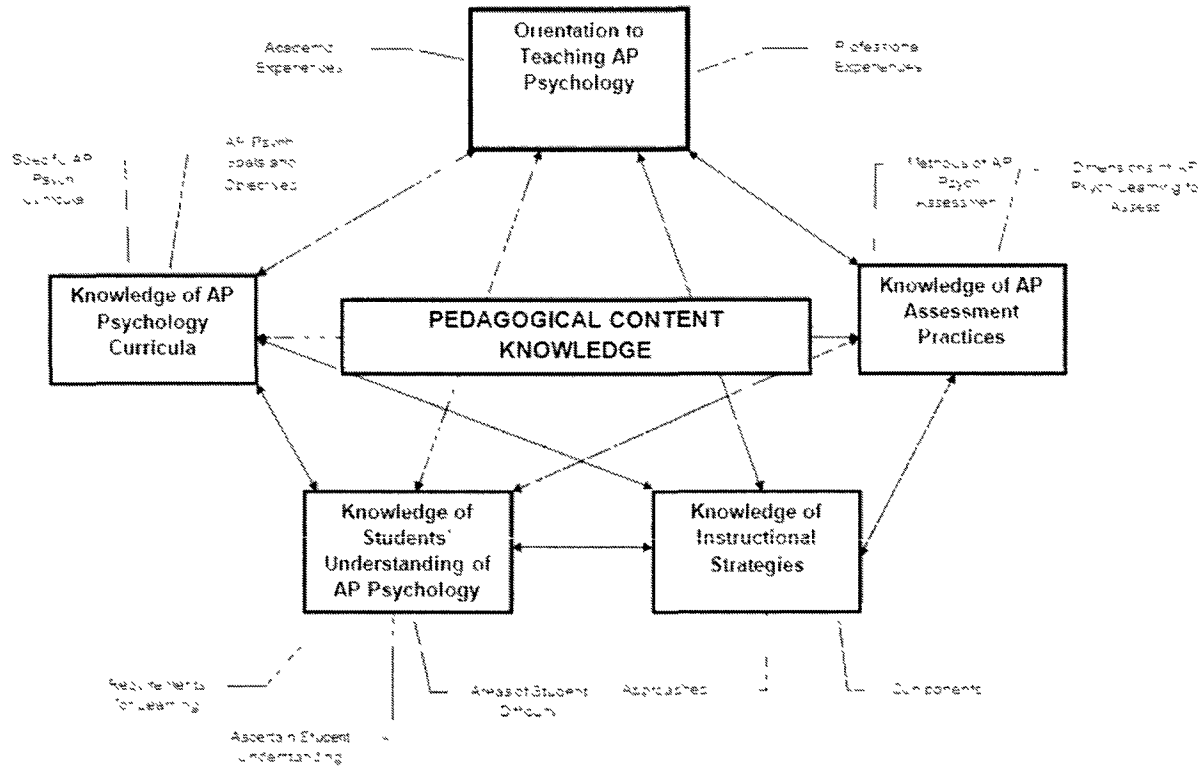
Conceptual Framework

The Pedagogical Content Knowledge of AP Psychology Teachers

Building upon the review of literature and the work of Shulman (1987), Grossman (1990), Magnusson et. al (1999), Grossman et. al (2005), and Hashweh (2005), PCK is conceptualized in this study as consisting of five components: (1) orientations toward teaching AP Psychology, (2) knowledge about the AP Psychology curriculum, (3) knowledge about

students' understanding of AP Psychology, (4) knowledge of instructional strategies for teaching AP Psychology, (5) knowledge about assessment in AP Psychology

Figure 6 – Conceptual Framework of PCK for AP Psychology Teachers



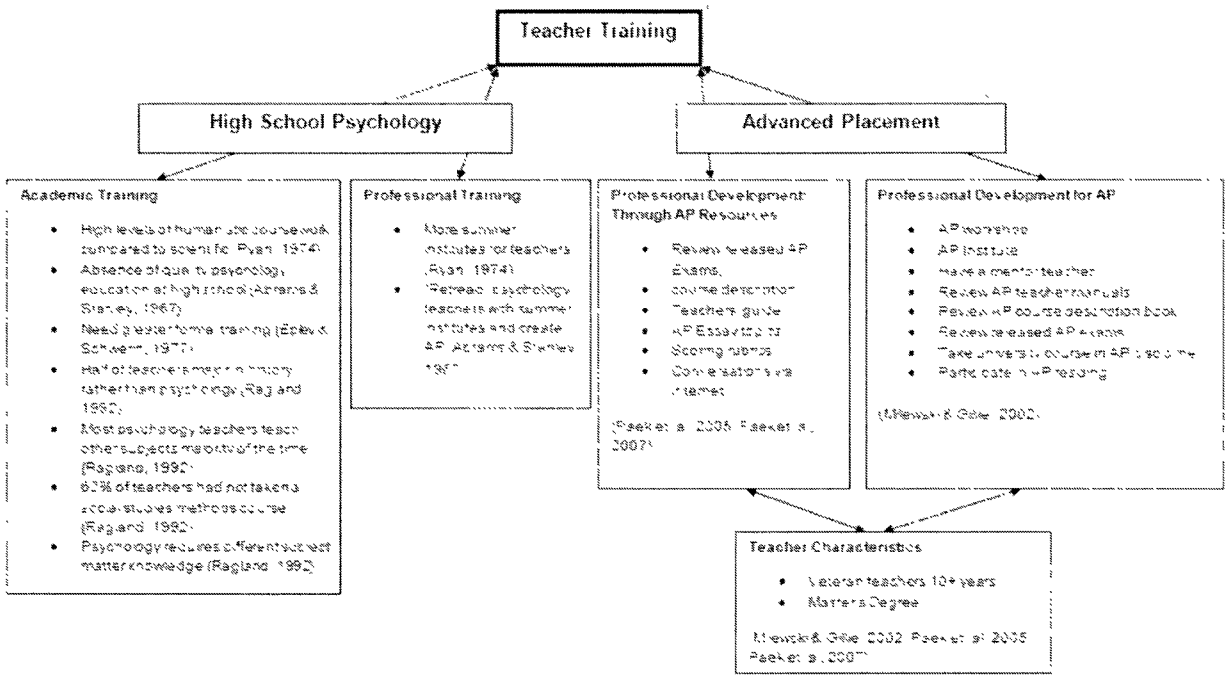
Orientations to Teaching AP Psychology

This component of pedagogical content knowledge refers to the academic and professional training and experiences that influenced the development of teachers' knowledge and beliefs for teaching AP Psychology. As demonstrated in the review of literature, various stakeholders promoted academic and professional training opportunities for teachers to enhance their development of teacher content knowledge. The creation of AP Psychology was designed to refocus the teaching of psychology from a humanistic-orientation to a more

scientific study of psychological content and to give greater credence to the subject of psychology in schools.

Preliminary studies of high school psychology teachers called for the strengthening of teacher content knowledge and training in methods that were unique to psychology instruction (Engle, 1952, 1967; Abrams and Stanley, 1967; Ryan, 1974; Anderson, 1965; McFadden and Pasewark, 1970; Noland, 1967; Epley and Schwerin, 1977; Wertheimer, 1973; Ragland, 1992). Researchers also recognized the crucial need to train teachers for AP Psychology and recommended the development of networks of support from professional organizations like the American Psychological Association and post-secondary level professors (Abrams and Stanley, 1967; Ryan, 1974). In addition, the College Board developed professional development training and resources designed to augment teachers' understanding of the AP course structure and Exam process (Milewski and Gillie, 2002; Paek et. al, 2005; Paek et. al, 2007). Highly organized and systematic pathways for academic and professional development were designed to influence the development of teachers' content knowledge for teaching AP Psychology.

Figure 7 – Literature support for teacher training in high school psychology and AP.



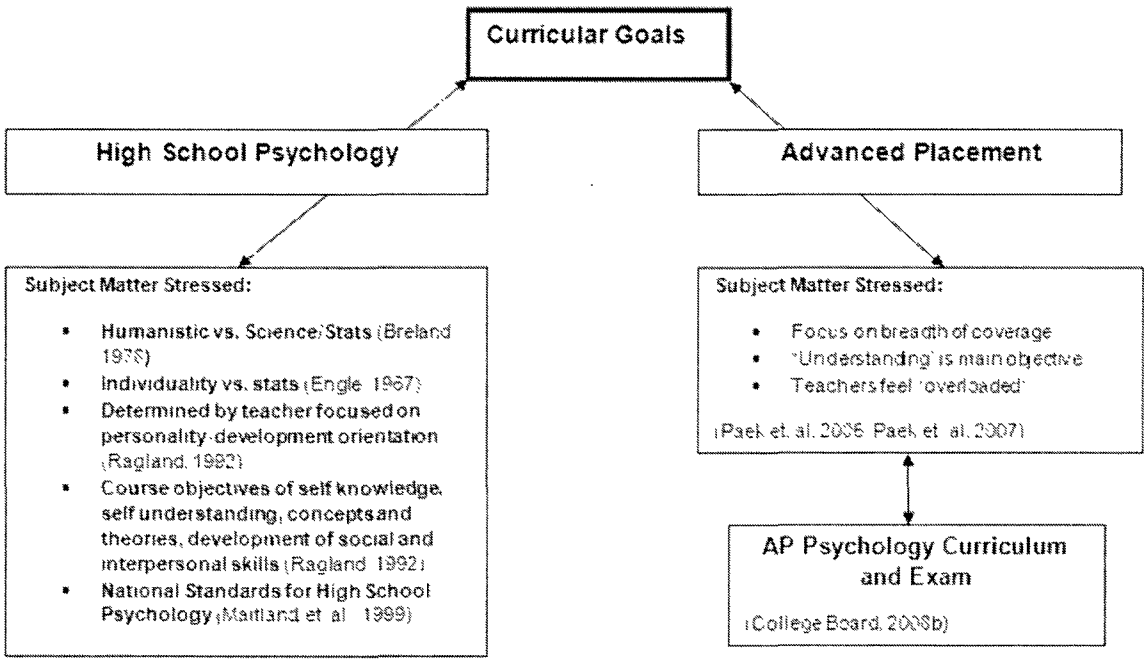
Orientation to Teaching AP Psychology is closely related to the PCK category: Knowledge of Subject Matter. In previous studies of PCK, teachers' knowledge of subject matter is a result of subject area understanding that included the "nature, form, organization, and content of teacher knowledge" (Grossman, et. al., 1989, p. 25-26). For Hashweh (2005), this development includes substantive and syntactic knowledge; both of which are necessary for deep conceptual understanding within a discipline. Development of subject area knowledge for AP Psychology teachers is derived from training received through academic and professional experiences.

Knowledge of AP Psychology Curriculum

This component of PCK refers to the nature and dimensions of internal and external curricular goals and objectives for the classroom setting. The research on high school

psychology determined which subject-matter was stressed most; hence, the goals and objectives of the curriculum were more humanistic than scientific in nature (Engle, 1967; Ryan, 1974; Breland, 1978; Ragland, 1992). AP Psychology is an outcome of years of studies that pushed for a scientifically oriented psychology course in the college preparation track (Dambrot & Popplestone, 1975; Federici and Schuerger, 1976; Griggs, Jackson, and Meyer, 1989). The AP Psychology Curriculum is highly structured and guides teachers' decision-making to focus content coverage as preparation for the AP Psychology Exam, a high-stakes test that determines students' eligibility for college credit.

Figure 8 – Literature support for curricular goals in high school psychology and AP.



The AP Psychology curriculum outlines a framework to guide teachers' decision-making for curriculum and instruction. It follows that this category be based on Grossman's (1990) inclusion to the conceptual model of PCK. Grossman (1990) identifies teachers' knowledge and conceptions about the purpose of teaching at different grade levels are reflected in her goals for

teaching the subject matter and the structuring of the curriculum. Researchers have demonstrated that knowledge of goals and objectives affects instruction (Magnusson et. al., 1999) and determines how teachers present material to students (Fernandez-Balboa & Stiehl, 1995).

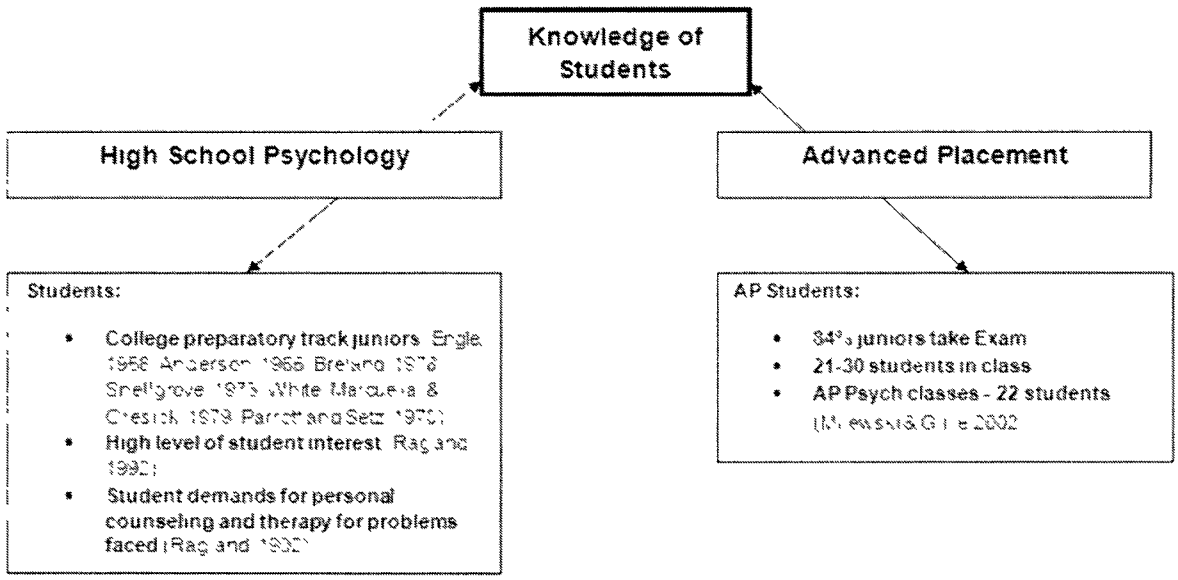
The *Knowledge of AP Psychology Curriculum* component of PCK is adapted and modified from Magnusson et. al., (1999) to include two categories: (1) goals and objectives for students and (2) specific curricular programs and materials. The first category of the curricular knowledge component of PCK includes teachers' knowledge of the goals and objectives for students in the two units of instruction from the AP Psychology curriculum. The second category of teachers' knowledge of the AP Psychology curriculum consists of knowledge of programs and materials that are relevant to teaching a particular domain of AP Psychology

Knowledge of Students' Understanding of AP Psychology

This component of pedagogical content knowledge refers to knowledge teachers must have about students in order to help them develop specific AP Psychology knowledge. Findings from previous research were limited in scope and provide little information beyond psychology offered as an elective social studies course and students have traditionally been high school juniors and seniors in a college preparatory track (Engle, 1958; Anderson, 1965; Breland, 1978; Snellgrove, 1973 cited in Rolson and Medway, 1982; White, Marcuella, and Oresick, 1979; Parrott and Setz, 1970). In addition, Ragland (1992) points out that students have a high level of interest in psychology and made demands for personal counseling and therapy for the problems they faced. Research on social studies AP students indicates a large percentage of juniors take Exams and AP Psychology class size averages twenty-two students (Milewski and

Gillie, 2002). In sum, the extant literature provides little in terms of understanding students in order for teachers to assist in the development of specific AP Psychology knowledge.

Figure 9 – Literature support for knowledge of students in high school psychology and AP.



Specific to PCK, this component refers to teachers' knowledge of students in order to help them develop specific knowledge of AP Psychology concepts or topics. Teachers' knowledge of students' understanding of AP Psychology derives from Grossman (1990), Grossman et. al (2005), and Hashweh (2005) in an effort to determine the additional facets of teachers' ability to anticipate students' understanding or misunderstanding within the subject matter. For example, this component explores teachers' ability to respond to diverse learners, and to address student understanding or misunderstanding by providing examples and various representations of the content that make the concepts that are taught more accessible to students.

The *Knowledge of Students Understanding of AP Psychology* component includes three categories of knowledge adapted and modified from Magnusson et. al (1999) : (1) requirement for learning specific AP Psychology concepts; (2) ascertaining student misunderstanding; and (3) areas of AP Psychology that students find difficult. The first category, requirements for learning, refers to teachers' knowledge about the students, school context, and student abilities as they relate to the development of instruction for the classroom. The second category, ascertain student misunderstanding, refers to teachers knowledge of the modes through which teachers gauge student learning. Areas of student difficulty refer to teachers' knowledge of the psychology concepts or topics that students find difficult to learn.

Knowledge of Assessment in AP Psychology

This component of PCK was not present in the previous models discussed; however, Shulman (1987) described PCK as "the ways of talking, showing, enacting, and otherwise representing ideas so that the unknowing can come to know, those without understanding can comprehend and discern, and the unskilled can become adept" (p. 7). Thus, an examination of PCK should include the aspect of students' understanding of the knowledge that was delivered - through the assessment practices of teachers.

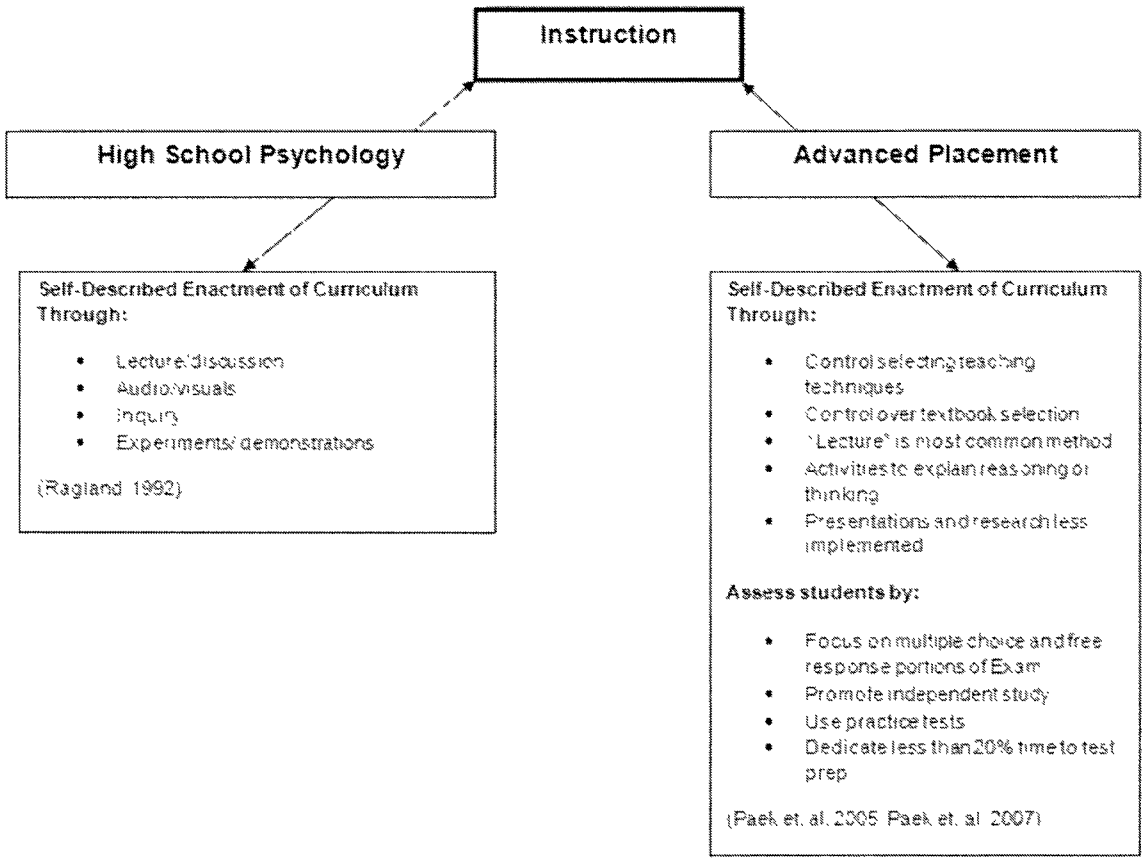
As mentioned previously, the AP Psychology Curriculum is highly structured and guides teachers' decision-making to focus content coverage as preparation for the AP Psychology Exam, a high-stakes test that determines students' eligibility for college credit. Traditionally, assessment practices by Advanced Placement teachers consists of: focus on the multiple choice and free response portions of the Exam, promote independent study; use practice tests; and dedicate time for test preparation (Paek et. al, 2005; Paek et. al, 2007).

The *Knowledge of Assessment in AP Psychology* component consists of two categories modified from Magnusson et. al (1999: (1) knowledge of the dimensions of AP Psychology learning that are important to assess, and (2) knowledge of the methods by which that learning can be assessed. The first category, knowledge of dimensions of AP Psychology learning to assess, "refers to teachers' knowledge of the aspects of students' learning that are important to assess within a particular unit of study" (Magnusson et. al, 1999, p. 108). In this category, the content outlined in the AP Curriculum is of particular interest. The second category, knowledge of methods of assessment, refers to: "teachers' knowledge of the ways that might be employed to assess the specific aspects of student learning that are important to a particular unit of study" (Magnusson et. al, 1999, p. 109). Due to the high stakes nature of the AP Exam, teachers' assessment practices are modeled after the multiple choice and free response portions of the Exam.

Knowledge of Instructional Strategies for Teaching AP Psychology

This component refers to instances of how knowledge is transformed and represented during instruction to promote student understanding by focusing on teachers' content representations, professional and pedagogical repertoires, and knowledge transformation in teaching difficult topic-specific subject-matter (Grossman et. al, 2005; Hashweh, 2005). Findings from previous research were limited to one study which demonstrated teachers of high school psychology traditionally enact curriculum through: lecture/discussion, audio/visuals, inquiry, experiments/demonstrations (Ragland, 1992). Research on the teaching practices of AP teachers is equally scant with respect to instructional strategies. Findings from Paek et. al, (2005) and Paek et. al (2007) established: lecture as the most common method, course activities were used to explain reasoning or thinking, and presentations and research were less implemented forms of instructional.

Figure 10 – Literature support of instructional practices in high school psychology and AP.



In order to move in a direction to include more diverse instructional strategies, a taxonomy was constructed to organize the teachers' instructional strategies for teaching AP Psychology based on a list of instructional approaches and components developed by Reigeluth and Keller (2009). According to Reigeluth and Carr-Chellman (2009), instruction is defined as "*anything that is done purposely to facilitate learning*" (p. 6). This definition is a result of a Delphi study to reach consensus among instructional theorists about terminology for the major constructs that make up instructional theories and two categories for classifying instructional methods: instructional approaches and instructional components. Instructional approaches "set a general direction or trajectory for the instruction and are comprised of more precise or detailed

components (Reigeluth and Keller, 2009, p. 31). One might consider the following instructional approaches: problem-based learning, inquiry-based instruction, and direct instruction. Each approach is a macro strategy that is comprised of many smaller, more precise, methods or components. Instructional components are selected by the practitioner depending on the situation and often in concert with other smaller, more precise, micro-strategies. One might consider the following examples of instructional components: advance organizer, guided practice, reciprocal teaching.

Reigeluth and Keller (2009) suggest practitioners choose the approach first and then the variable components for instruction. For example, a teacher might choose inquiry-based instruction as the approach for a lesson where instruction is based on student interest, students asking questions, and learning is centered on students answering those questions. A teacher might then provide several components for instruction to facilitate learning. For example, a teacher could provide students with an advance organizer as a framework for assessing internet sources; interact with students to provide guided practice to assist students in the organization of warrants and claims in response to their selected question; and pair students for a reciprocal teaching activity where students are responsible for helping others learn.

Previous research of PCK identified knowledge of instructional techniques and materials as the use of appropriate methods of instruction and resources for the particular grade-level and subject matter (Gudmundsdottir & Shulman, 1987; Marks, 1990; Morine-Dershimer & Kent, 1999; Fernandez-Balboa & Stiehl, 1995; Loughran et. al., 2004; van Driel, 1998; Grossman, 1990; Meijer, et. al., 1999). However, Hashweh (2005) suggested teachers' PCK developed from cases of repeated experiences of teaching a familiar topic and the interaction of different categories of teacher knowledge. For example, through experience, a teacher may develop a repertoire for representing content and transforming knowledge of topic-specific subject matter

in a variety of ways that interact with their knowledge of student difficulties and misconceptions. As influenced by the literature, *Knowledge of Instructional Strategies for Teaching AP Psychology,* as a category of PCK, focuses on teachers' enactment of the AP Psychology curriculum to represent content and transform knowledge through ones personal repertoire of instructional strategies.

Chapter Four: Research Design and Questions

Rationale for Mixed Methods

Ercikan and Roth (2006) argue the polarization of qualitative and quantitative methods contributes to the privileging of certain data collected instead of focusing on good questions and good research. They suggest the dichotomy is inappropriate for educational research because: all phenomena are quantitative and qualitative at the same time; data construction processes follow similar interpretation processes for all educational research; and, of interest are data construction processes based on subjective, defensible judgments (p. 18). Latour (1999) calls for a shift from the entrenchment in either quantitative or qualitative methods; instead, to consider research as a continuous scale of inferences because of the nature of translation of data is one from representation to representation. Johnson and Onwuegbuzie (2004) apply the contingency theory to research approach selection and the acceptance that all methods can be superior when the researcher's task is to examine specific contingencies to make decisions about the approaches in a study. Sechrest and Sidana (1995) suggest combining or mixing approaches of quantitative and qualitative methods reduces problems and limitations associated with singular methods.

Therefore, a mixed methods model is the chosen approach to research with a concurrent triangulation strategy of inquiry (Cresswell, 2003), an approach Van Driel and De Jong (2001) argue for in studies of pedagogical content knowledge. In this model, multiple methods will be employed drawing on multiple forms of data to confirm, cross-validate, and corroborate findings in the study (Greene, Caracelli, & Graham, 1989; Morgan, 1998; Steckler, McLeroy, Goodman, Bird, & McCormick, 1992). This model is used to offset weaknesses inherent in one method with the strengths of the other and is integrated during the interpretation

phase; the interpretation can either note the convergence of findings as a way to strengthen knowledge claims or explain any lack of convergence (Cresswell, 2003). Data will be collected using both quantitative and qualitative methods integrated at different stages of inquiry.

Case study methods of inquiry are particularly appropriate for studies considering teachers and teachers' knowledge because case studies help researchers develop a better understanding of the teacher and decisions made during the course of teaching (Wilson & Gudmundsdottir, 1987). In studies of pedagogical content knowledge, the most prominent method used is an in-depth case study. A common factor in many of these studies is the use of an interview protocol (Fernandez-Balboa & Stiehl, 1995; Meijer, et. al., 1999) and classroom observations (Grossman, 1990; Rovegno, 1994).

The questions guiding the study are:

1. **How do different categories of knowledge interact to form the AP Psychology teachers' pedagogical content knowledge?**
2. **What are the critical attributes of AP Psychology teachers' pedagogical content knowledge that guided the participants' instruction of the Research Methods and 'Preferred' units of the AP Psychology curriculum?**
3. **To what extent do the instructional practices of AP Psychology teachers contribute to student learning of the content in the Research Methods and 'Preferred' units of the AP Psychology curriculum?**

Sample

According to Stake (2006) multiple case studies should include a sample of between four and ten cases to show interactivity between programs and their situations. The sample includes five teachers and their students were selected based on models-of-wisdom studies (Wineburg & Wilson, 1988; Ladson-Billings, 1994; Hess, 2002). The method of selection follows Shulman's (1983) recommendation that "good cases" be studied in order to learn from the

possible. To find "good cases," I solicited recommendations from experts in AP Psychology (professional development workshop leaders) and Student Grade Reports available from school AP Coordinators for teachers with an 85% or higher pass rate. Recommendations were verified by school administrators. Students in AP Psychology classes among the five teachers were also solicited and ranged from 15-27 students. Consent and assent was not secured for all students at the different sites and not all students completed the series of tests (N=112).

Overview of Teachers

School 1 – Sara: Background and Experience

In the case of Sara, her academic preparation occurred over 30 years ago. She majored in social studies and tried to be a psychology major because after completing 30 credit hours toward the major, she could not fulfill the requirements of the experimental class because she had to work with rats. As a result of her phobia and general dislike for rodents, she earned a minor in psychology. Sara retired in the spring of 2010 after a 32 year career as a high school classroom teacher. During the time of the study, AP Psychology was offered as a semester-long course and her students achieved an 85% pass rate. The school operated on a four-block schedule, and Sara taught 90 students in three sections. For 29 years she taught "regular" psychology and AP Psychology since the first Exam was administered in 1992.

School 2 – John: Background and Experience

John was selected for the study in part due to his students' success on the AP Psychology Exam. Historically, his students achieved a 94% pass rate on the AP Psychology Exam. He was a highly respected teacher and unequivocally recommended by the greater community of AP Psychology teachers. Prior to a thirty-two year teaching career, John earned majors in psychology and history. During that time, John has always taught psychology in one

form or another and, from 1992 on, AP Psychology. At the time of the study, John taught over 130 students in five sections of AP Psychology during the school day. His school schedule consisted of a seven period day and taught AP Psychology for the full school year.

School 3 – Steve: Background and Experience

For many years, Steve's students demonstrated high levels of participation and successful achievement on the AP Psychology Exam with pass rates of over ninety percent. Steve's background and experience is unique when compared to the other teachers in the study. While he did take some psychology in college, he was not certified to teach psychology at the high school level. Psychology grew in popularity at his high school, and his administration suggested he take some additional courses in psychology to get certified. At the time of the study, Steve taught over 120 students in five periods of AP Psychology; his only prep during the day. AP Psychology is a year-long course at Steve's school. Because of the significant growth in the number of students taking AP Psychology, his school had to assign additional AP Psychology sections to another teacher to accommodate students' requests.

School 4 – Jennifer: Background and Experience

Jennifer majored in psychology as an undergraduate and earned Masters' Degree in Education. Her teaching career began in 1997 and taught at two different high schools. At her first school, she taught regular psychology for one year and then took over teaching AP Psychology for a retired colleague. She moved to her current school four years ago and also taught regular psychology for her first year. At that time, AP Psychology was not offered; and Jennifer was responsible for bringing the class to the social studies department. During the study she taught AP Psychology to around 90 students over three periods as a year-long course and her students have achieved a 92% pass rate. AP Psychology was Jennifer's only prep

during the day. Unlike the other teachers in the study, Jennifer did not teach full-time; rather, she job shares with another teacher at her school.

School 5 – Michelle: Background and Experience

Michelle earned a BA in Psychology and a Masters' degree in Social Science; the focus of her thesis was on the self-esteem of sexually abused girls. She began her career working outside the field of education with emotionally disturbed teenage girls in group homes and in in-patient psychiatric care with teenagers. Eventually she decided to go back to school for her teaching credentials and has been in the classroom now for fourteen years. Michelle has taught psychology in some form throughout her career along with other social studies courses and has been teaching AP Psychology since 2006. During the study she taught AP Psychology to 25 students in two sections of a 4x4 block schedule during the second and third quarters of the school year; her students have achieved an 85% pass rate on the AP Psychology Exam.

Data Gathering and Data Types

This study was approved by the University of Wisconsin, Madison Institutional Review Board (IRB) under the title Pedagogical Content Knowledge of AP Psychology Teachers; protocol number: SE-2009-0662. As outlined in the proposal, three types of qualitative data were collected for this study: semi-structured interviews, field notes from classroom observations, and classroom artifacts related to the units of instruction, such as syllabi, power point presentations, and student assignment packets. Quantitative data was also collected in the form of pre- and post- tests for the Research Methods and exemplar units of instruction.

Semi-structured Interviews

A semi-structured in-depth interview was employed for the purpose of this study (Wengraf, 2001). Teachers were interviewed three times to provide data for research questions

one and two. Interviews were conducted consistently for all teachers: (1) prior to teaching the Research Methods unit, (2) following the Research Methods unit, (3) following the 'preferred' unit. All interviews lasted between 45-60 per teacher and presented the best method for rendering the specialized knowledge, skills, and expertise of AP Psychology teachers in topic-specific subject matter by making the tacit explicit for all audiences. Structured questions enabled the researcher to compare interviews between and within teachers while questions of a semi-structured nature allowed for unique emergence of teacher interests (See Appendix A). When used in a concurrent triangulation strategy of inquiry, the interviews provided a context in which to interpret the data.

Classroom Observations

Teacher participants engaged in regular classroom interactions that occurred whether or not the researcher was present for four classroom observations totaling 200-360 minutes. The role of the researcher was as an unobtrusive observer entering the setting only to gather data from interviews, observations, and teacher artifacts (i.e., handouts); and, for collection of all consent/assent forms, surveys, and all tests directly from students.

Pre- and Post- Tests

A pre- and post-test of 20 multiple choice questions were administered to students during the Research Methods and teacher "preferred" units of instruction to provide data in response to research question three (see Appendix B). Tests were administered before students were assigned readings or participated in activities related to the unit and at the end of the unit, before the teachers' unit test was administered. Prior to the administration of the pre- or post- tests, teachers were not made aware of the questions or content. All tests contained questions augmented from released AP Exams, textbooks, and commercial study materials to

model test questions from the AP Psychology Exam. To design the tests, a master list of test questions was developed; each question was assigned a number, and organized on a spreadsheet. Using the random numbers feature of SPSS, twenty unique value numbers were generated and the individual pre- and post-tests were created to control for test effects. Pre- and post-tests for the Research Methods unit were the same and received by all participating students.

Student Surveys

Student participants complete a short survey during normal class time at beginning of the research. Questions were asked to provide additional information regarding the students: grade level, previous math and psychology classes taken, previous AP classes and Exams taken, enrollment in other AP classes, and plans to take AP Exams (see Appendix C).

Data Analysis

Qualitative

To identify convergence in the data (Patton, 1990), all interview transcripts, field notes, and artifacts were coded by the researchers. First, an inductive, open coding process was utilized to identify emergent themes. To discern the relationship between these emergent themes, an axial coding process was utilized, whereby the researcher engaged in "clustering themes into conceptual groupings, making metaphors for the integration of diverse pieces of data, subsuming particulars into the general, shuttling back and forth between first-level data and more general categories, noting relations between variables, building a chain of evidence and making conceptual/theoretical coherence" (Huberman & Miles, 1988, p. 26). After the data were open and axial coded and emergent themes were identified and relationally described, they were examined in relation to the conceptual framework for pedagogical content knowledge.

Quantitative

Test data were analyzed quantitatively using descriptive and inferential statistics testing means and variance to help understand student achievement within and between groups. Students were tested over content from the Research Methods unit. Data collected were based on aggregate student scores from pre- and post-tests of 20 augmented multiple choice questions. SPSS software was used to analyze data with tests of ANOVA to answer whether average gain scores is different between and within four groups. Furthermore, Tukey post-hoc pairwise comparisons were made.

Table 3: Data Collection Timeline

Teacher	RM Unit	Preferred Unit	Interviews	Observations	Tests
Teacher 1 – Sara	Jan.-Feb. '10	Feb. '10	Jan. 25, Feb. 2, 12	Jan. 28, Feb. 2, 8, 10	Jan. 25, Feb. 3, 12
Teacher 2 – John	Sept. '10	Oct. – Nov. '10	Sept. 2, 13, Nov. 16	Sept. 9, 13, Oct. 26, Nov. 5	Sept. 2, 13, Oct. 21, Nov. 8
Teacher 3 – Steve	Sept. '10	Oct. '10	Sept. 7, 28, Oct. 18	Sept. 17, 23, Oct. 1, 14	Sept. 7, 28, 30, Oct. 18
Teacher 4 - Jennifer	Sept.-Oct. '10	Oct. – Nov. '10	Sept. 8, Oct. 6, Dec. 1	Sept. 27, 29, Nov. 17, 22	Sept. 20, Oct. 1, Nov. 4, 29
Teacher 5 – Michelle	Nov.-Dec. '10	Dec. '10	Nov. 8, 18, Dec. 15	Nov. 16, Dec. 7, 8, 9	Nov. 8, 16, 23, Dec. 10

Reliability

Data collected from test scores, observations, interviews, and artifacts will be both quantitative and qualitative in nature; these data will be examined with in a developmental

manner (Greene, et. al., 1989); in other words, qualitative methods will be used to inform and provide richer context for the quantitative methods employed. Thus, reliability will be achieved through triangulation of multiple data sources and through inter-rater reliability.

Ethical Considerations

From a practical and ethical point of view, a great deal of preparation and work went into a research study of this magnitude. One challenge was to make sure that the criteria for the IRB were met including: right to participate voluntarily; detailed purpose of study; procedures of the study so individuals can anticipate the research; right to ask questions; benefits of the study; signatures of both the participants and researcher to agree to the provisions. Therefore, I considered the nature of the interactions involved with the study and accounted for individuals who choose not to participate. These issues were considered through feedback from committee members and ongoing reflection.

There were no major risks to the participants of this study and the researcher took steps to mitigate potential risks. The researcher protected the privacy and confidentiality of the teachers throughout the research and assured the teacher that data collected was not evaluative of the teacher. As the researcher, I met with the teachers several times prior to the beginning of the study in order to: a) visit the teachers at their working environment; b) informally observe the teacher instructing the designated class to be observed. In addition, the preliminary meetings were aimed to develop rapport with the teachers on: a) topics related to psychology in/outside of school; b) topics that were not related to psychology education; and by (c) sharing personal information with the teachers. The building of rapport was essential in establishing a safe and comfortable environment for the teacher and researcher.

Teacher participants engaged in regular classroom interactions that occured whether or not the researcher was present. Four classroom observations (2 for the Research Methods unit and 2 for the 'preferred' unit) took place for a total of 220-360 minutes. Teachers participated in three semi-structured interviews to explore aspects of their pedagogical content knowledge and were conducted at a time and place of mutual agreement that did not interfere with the teachers' contractual obligations to the school. Two interviews took take place during the week(s) of the Research Methods unit and one prior to the 'preferred' unit. Cognizant of teachers' time restraints, interviews lasted 45-60 minutes; with a total amount of time of 135-180 minutes. Course materials from the teacher were also collected and analyzed.

Student participants were asked complete a brief survey during normal class time at beginning of the research to identify their grade level, previous math and psychology classes taken, previous AP classes and Exams taken, enrollment in other AP classes, and plans to take AP Exams. Participants were asked to complete 20 question augmented pre- and post-tests from the Research Methods unit and from the teachers' 'preferred' unit of instruction. The tests served as an evaluation of normal educational practice and took place during class time for a total of 45 minutes. Confidentiality was maintained and disruption to class time minimized to the duration of the test by allowing each student to participate in the classroom testing activities regardless of whether they have consent or assent to participate in the data collection part of the study.

Proportion of Time for One Year: unit length from 1-2 weeks; class periods from 45-90 minutes; classroom observations from 90-135 minutes; normal instructional time for data collection from student surveys and tests approximately 85 minutes. The role of the researcher was as an observer-participant entering the setting only to gather data from interviews and

observations; and, for administration and collection of all consent/assent forms, surveys, and tests directly from students.

With respect to privacy and confidentiality, The following safeguards were employed to protect the participant's rights: 1) the research objectives were articulated verbally and in writing so that they were clearly understood by the participants, including a description of how the data will be used; 2) written permission to proceed with the study as articulated was received from the participants; 3) descriptive and inferential statistics from the tests and survey were calculated in the aggregate and made available to the participants; 4) the participants were informed of all data collection devices and activities; 5) verbatim transcriptions and written interpretations and reports were made available to the participants; 6) the participant's rights, interests, and wishes were considered first when choices are made regarding reporting data; and, 7) the final decision regarding participants' anonymity rests with the participants.

Confidentiality was maintained for all participants. All documents and artifacts collected were secured in the researcher's locked private office on campus in a locked file cabinet between times of analysis. All names and other identifiers were removed and pseudonyms given. Subcodes were developed for identification and the master code list was kept separately in a locked file cabinet in the researcher's locked private office on campus. Items from those who withdrew from the study or did not consent were collected but not used as sources of data. Data that was analyzed and stored were password protected, saved on a hard drive without an internet connection, and stored in the researcher's locked private office on campus in a locked file cabinet. Any use of examples from audiotapes, transcriptions, and documents had prior consent and clearance from the individual and were checked with the individual for accuracy before being included in the final draft of the research.

Images, documents, and audio recordings were sources of data for the study. The semi-structured interviews with teachers were recorded and transcribed by the researcher. In instances of confusion or when the recording was unclear, the interviewee was allowed to listen to that portion of the recording; otherwise, the researcher was the only person to hear the recording. During the transcription of the recording, I used headphones to listen to the recording. Data derived from the recordings in the form of transcriptions had prior consent and clearance from the individual and were checked with the individual for accuracy before being included in the final draft of the research.

For the recordings, I used technology applications, software, and computerized data storage. All recorded semi-structured interviews were done with a digital audio recorder and the file of the recording was in mP3 format. Recording and transcription of the interview were saved on a password protected hard drive without an internet connection and will remain stored in a locked private office for a seven year period before being destroyed.

Chapter Five: Research Findings

The findings for the study are organized in accord with the central research questions:

1. **How do different categories of knowledge interact to form the AP Psychology teachers' pedagogical content knowledge?**
2. **What are the critical attributes of AP Psychology teachers' pedagogical content knowledge that guided the participants' instruction of the Research Methods and 'Preferred' units of the AP Psychology curriculum?**
3. **To what extent do the instructional practices of AP Psychology teachers contribute to student learning of the content in the Research Methods and 'Preferred' units of the AP Psychology curriculum?**

In the first section, I describe the critical attributes that form AP Psychology teachers' pedagogical content knowledge. The section is based on the conceptual framework to highlight the different components that form teachers' pedagogical content knowledge. Specifically, the following components of pedagogical content knowledge are discussed: orientations to teaching AP Psychology, knowledge of the AP Psychology curriculum, knowledge of students understanding of AP Psychology, knowledge of instructional strategies for teaching AP Psychology, and knowledge of assessment in AP Psychology.

In the second section, I illustrate the ways pedagogical content knowledge influence AP Psychology teachers' instruction during the Research Methods and 'Preferred' units of the AP Psychology curriculum. The section focuses on teachers' enactment of the AP Psychology curriculum through the individual teachers' personal repertoire of instructional strategies as they represent content and transform knowledge for student understanding.

In the final section, I examine student pre- and post test data to determine the extent to which the instructional practices of AP Psychology teachers contributed to student learning in the Research Methods and 'Preferred' units of the AP Psychology curriculum.

Research Question 1: How do different categories of knowledge interact to form the AP Psychology teachers' pedagogical content knowledge?

Orientations to Teaching AP Psychology

This component of pedagogical content knowledge refers to the academic and professional training and experiences that influenced the development of teachers' knowledge and beliefs for teaching AP Psychology. As demonstrated in the review of literature, various stakeholders promoted academic and professional training opportunities for teachers to enhance their development of teacher content knowledge. The creation of AP Psychology was designed to refocus the teaching of psychology from a humanistic-orientation to a more scientific study of psychological content and to give greater credence to the subject of psychology in schools.

Sara

In Sara's case, her traditional academic preparation occurred over 30 years ago and resulted in a major in social studies. Her initial intention was to major in psychology but after completing 30 credit hours toward the major, she could not fulfill the requirements of the experimental class because she had to work with rats. As a result of her phobia and general dislike for rodents, she instead earned a minor in psychology. Sara retired in the spring of 2010 after a 32 year career as a high school classroom teacher and had taught AP Psychology since its inception in 1992.

According to Sara, the bulk of her professional development and psychology-specific training in content and pedagogy came from active participation in various AP Psychology teacher workshops. In 1997, she attended a month-long workshop at Northern Kentucky University which she described as the "most intense experience." The program focused teachers on content in the morning session and activities to do with students in the afternoon.

In Sara's words, the program "guided me so that I make sure I am covering the stuff they're going to be tested on." As a self-described "life-long learner," Sara's voluntary participation in professional development provided an opportunity to bolster her pedagogical practices in the classroom. In the next quote, Sara demonstrated what she learned through her professional development experiences and the ways in which her learning transfers to her classroom instruction:

> "We went through every unit and they basically taught us things – it was like taking an introductory psych class and they basically did activities that they thought would help us to help our students understand the material. So, lots of hands on kinds of things – I think a lot of the activities I do are things that I had learned there and again when you do them then you understand them better than if you just read about them in a journal.

Every year, for as long as she could remember, she also attended the Midwest Institute for Students and Teachers of Psychology at the College of DuPage. Locally, Sara was an active member of a professional development group for teachers of AP Psychology and professional organizations like Teachers of Psychology in Secondary Schools (TOPSS) and the Wisconsin Council for the Social Studies (WCSS). She was also an active and regular contributor and participant on the Teachers of Psychology List-Serv and subscribed to several trade journals for teaching psychology.

John

John was a highly coveted selection in that he was unequivocally recommended by the greater Wisconsin community of AP Psychology teachers. Prior to a thirty-two year teaching career, John earned majors in psychology and history. Throughout his career he has "taught psychology in one form or another" and AP Psychology since its inception in 1992. During interviews John alluded to a traditional academic experience as important in the development of content area knowledge, but explicitly mentioned self-guided learning and the impact of teacher professional development workshops.

> "Most of it, it started in the NSF workshop; that was the first thing probably that planted the seed as I said before. After that it has been for the most part learning it on my own. Probably 70% of it is learning on my own; 30 % is workshops, maybe a class or two, something like that."

At one month-long workshop in particular, John participated in a program that focused on content knowledge development in the morning and integrating technology in the afternoons; a blending of content and pedagogy. In his view, participation in the workshop transformed his approach to teaching psychology.

> "What probably changed me in lot of directions in my teaching was actually the month-long in Houston because the month-long in Houston had a two-prong approach to it. In the morning we dealt with Psychology, we dealt with content. In the afternoon we dealt with this new thing called the internet. And I do a lot of technology and that was probably the thing that planted the seed – how can I use these things in school in my class other than just doing grades and everything else because I'm always looking at – I got a new cell phone, how can I use this in my class. That probably was the starting point."

In addition to being a participant in large national and regional level AP Psychology teacher workshops, John started a local professional development group for teachers of AP Psychology that meets twice a year. Thus, John had a special perspective different from the other teachers with respect to the different professional development opportunities available for AP Psychology teachers; he is heavily involved in a number of leadership roles. John described his professional role in AP Psychology through his activity with the College Board:

> "I've been a reader (AP reader) since 2005 and a table leader for the last three years, and for the last four or five years what the College Board refers to as an "endorsed consultant" which means I've gone through the training to teach teachers in basically one-day workshops or primarily what I do is summer-long or week long"

In addition to John's contributions to the College Board, he is an active contributor to the field of teaching psychology. For example, in 2003 and 2007, he developed content delivery platforms in the form of companion electronic power point presentations for a leading high school psychology textbook. Throughout the year, John is one of the moderators of a teaching high school psychology blog. His professional work outside of teaching is the way "he keeps his

content knowledge fresh." John's prominence is such that all participants in the study have attended at least one of his workshops and/or is a member of his local professional development group.

Steve

Steve's background and experience was unique compared to the other teachers in the study. Steve had some psychology in college but was not certified; instead, he took courses through a college extension program and taught general psychology from 1996 to 2004. In 2005, the AP Psychology teacher at his school left and he was told he would now teach the course. At the time, he did not want to teach AP Psychology because the person he replaced told him "teaching the course was something he could not handle." He told the administration he "did not want to teach the class," but ultimately the administration's decision was made. Thus, Steve was forced to learn the necessary content for AP Psychology through reading a variety of textbooks, reviewing materials shared to him by the departing colleague, and participating in local area teacher workshops. In the following example, Steve illustrates his organic process of developing content knowledge:

> "That's all self-taught. The content was not a part of the course I took through UW, so it is all what I knew from college biology courses. Every year I learn more from what is on the national exam that I have to go and learn."

In his first year, Steve "struggled developing activities" which led to heavy reliance on direction instruction even though he wanted to "expand his knowledge of psychology for teaching." As a result, when Steve first started teaching psychology, he joined the APA (American Psychological Association) and received various publications for teachers; however, he has since let his membership expire and is no longer a member. During his formative years as a psychology teacher, Steve submitted requests to attend professional development opportunities and was ultimately denied because of budget cuts at his school. More recently,

Steve started attending local AP teachers' conferences available for AP Psychology teachers that are offered every other year. In general, professional development opportunities have not been sought by Steve because of his busy schedule; much of Steve's academic and pedagogical preparation and development is a result of self-teaching influenced by the AP Psychology Curriculum and AP Exam.

Jennifer

Jennifer majored in psychology as an undergraduate and also earned a Masters' Degree in Education. Her teaching career began in 1997 and has taught at two different high schools. At her first school, she taught "regular" psychology for one year and then took over teaching AP Psychology for a retired colleague. She moved to her current school four years ago and also taught "regular" psychology her first year. At that time, AP Psychology was not offered and Jennifer was responsible for bringing the course to the social studies department. Unlike the other teachers in the study, Jennifer did not teach full-time; rather, her position is a job-share with another teacher at her school.

Despite formal academic training in psychology, Jennifer commented that her undergraduate training only prepared her to teach a general psychology course at the high school level, but did not prepare her well enough to teach AP Psychology.

> "I guess in all honesty coming out of; you know an undergrad degree in psych I was very prepared to teach a regular psych class. I don't, I had to do a tremendous amount of re-learning before I taught AP. I don't know that I was prepared.... I never had thought in the back of my mind I'm going to have to teach, you know, 18 distinct units in psychology so I should take more classes. You know, you take what you need to. So, I did find out that I had to do a lot of re-learning or in some cases learning, period, to teach it. "

As a consequence, Jennifer had to "re-learn" or in some cases "learn" the requisite content knowledge and instructional strategies to facilitate learning to prepare for teaching AP Psychology. During Jennifer's career, she attended five workshops that were in her geographic

area. From her workshop experience, she believed that they were most helpful for "early on as a new AP Psychology teacher, but not as helpful for those with more experience." Although she remains an active participant in professional development opportunities, Jennifer recommended opportunities for teachers in workshops to be divided by experience. As an example of her ongoing professional development, Jennifer is a participant in a local AP Psychology teacher professional development group led by John (another teacher in the study), an active member of Teachers of Psychology in Secondary Schools (TOPPS), and utilizes different internet based resources and online professional communities of teachers. In sum, Jennifer's professional development and professional associations have played a strong role her development of content knowledge and knowledge of instructional strategies.

Michelle

During Michelle's undergraduate education, she focused heavily on courses in developmental psychology and originally thought she wanted to be a clinical psychologist. Early in her career, she worked in group homes with emotionally disturbed youth and came to education as a third career. She possessed a different outlook on education compared to the other teachers in the study based on her experiences working overseas through the Model UN. Here Michelle shares more about her philosophy of education:

> "...my general philosophy is... when I was in India I got this phrase from an artist. We went to a seminar on art and learning about ourselves and one of the things he said was, 'being a guide at your side instead of a sage on a stage.' That pretty much sums up my philosophy regardless of what I am teaching. I might do more sage on a stage in a lower level class because I think those kids need more support but I assume at this level they need less support."

Like other teachers, Michelle was incredibly resourceful when it came to accessing and utilizing professional resources for her classroom. Coming from an applied psychology career, she possessed considerable content knowledge in fields such as developmental psychology,

abnormal psychology, and social psychology, but felt she required further development in the pedagogical aspects of teaching. One of her primary resources was a large binder of activities that came with the Myers textbook. In addition, Michelle used the *Activities Handbook for Teaching Psychology* and the *Critical Thinking Companion*. Prior to teaching AP Psychology for the first time, she attended an AP Psychology workshop in April 2005. She remains a member of the APA and TOPSS and frequently accesses the online resources the organizations make available for teachers. In addition to textbook, she frequently utilizes websites and general Google searches for supplemental activities to use in the classroom. In recent years, she has become acquainted with several AP Psychology teachers at other schools and developed a teacher network to engage in discussions and idea exchanges. Michelle prefers the personal connection to colleagues at other schools as an alternative to participation in list-servs and other online communities.

In sum, these teachers highlight the importance and value of ongoing academic and pedagogical professional development for AP Psychology teachers. Whether through collaborative opportunities working directly with colleagues from the greater AP Psychology teacher community or through means of self-teaching and, in some cases re-learning, the teachers' *Orientation to Teach AP Psychology* was a process that required cultivation beyond traditional academic preparation. Technology-based resources have provided AP Psychology teachers with mediums for communication and curricular enhancement.

Knowledge of AP Psychology Curriculum

This component of PCK refers to the nature and dimensions of internal and external curricular goals and objectives for the classroom setting. The *Knowledge of AP Psychology Curriculum* component of PCK is adapted and modified from Magnusson et. al., (1999) to

include two categories: (1) goals and objectives for students and (2) specific curricular programs and materials. The first category of the curricular knowledge component of PCK includes teachers' knowledge of the goals and objectives for students in the two units of instruction from the AP Psychology curriculum. The second category of teachers' knowledge of the AP Psychology curriculum consists of knowledge of programs and materials that are relevant to teaching a particular domain of AP Psychology.

Category One: Knowledge of the Goals and Objectives for Students

The first category of the curricular knowledge component of PCK includes teachers' knowledge of the goals and objectives for students in the two units of instruction from the AP Psychology curriculum. Examples of sources of knowledge of goals and objectives include the AP Psychology curriculum that outlines a framework for guiding decision-making for instruction.

AP vs. "Regular" Psychology

All of the teachers in the study taught both "regular" psychology and AP Psychology during their careers; at the point of the research, four of the five teachers exclusively taught AP Psychology. To better understand what makes AP Psychology different from "regular" psychology, teachers provided a context from their experiences. The most common description of the difference between AP and "regular" psychology is the high stakes nature of the AP Exam which forced teachers to do more content review and test preparation. Michelle provided the most cogent explanation of nature of the high stakes test:

> "There is a difference with the intro psych kids; it's more exposing them to material and people, but they are not really accountable for it or are tested on it at the same depth or breadth as AP."

For John and Steve, another difference between AP and "regular" is the schedule of the AP Exam and its impact on his teaching. The date of the AP Exam in May forced them to make

curricular decisions in order to cover a specific amount of content. As a consequence, they felt they had less time to utilize different methods of instruction and teaching tools. For example, John did not use cooperative learning groups because other means were more efficient to cover the content.

> "I don't do a lot of groups; I don't do buzz groups and those types of things. . I see a merit for those and I see how they can help the students understand the stuff but in some cases it is unfortunately a function of time. If I can do something and cover 5 concepts in a day, that's a worthwhile thing for me. If I get into buzz groups for 20 minutes and they're basically dealing with two concepts that's a lot of time to devote to two concepts. And so, unfortunately I guess that's one thing the AP Exam has forced us to do..."

Steve's view of the schedule and challenges of AP was similar to John and provided an interesting contrast in the nature and direction a "regular" psychology class would take.

> "we kind of go with the flow... if kids are really in to something, we'll go longer with it and we'll come up with other activities... we'll watch, you know, some other videos... we kind of run with it because they're liking it "

Of particular interest in Steve's description is the notion that student interest drives the pace, scope, and direction of the content. He went on to contrast this notion by explaining that in his AP classes, student interest played a limited role in driving the scope and direction of content delivery. Rather, instruction based on student interest was relegated to May, after the Exam.

> "Whereas what I found with AP is that I don't have that luxury, that in May I come back... I make notes on anything they seem to have an interest in and in May we'll come back and have some more fun with it."

This notion of student interest driving the pace, scope, and direction of "regular" psychology became clearer when teachers discussed the differences in the nature of the content from both courses. For Michelle, she tried to make "regular" psychology fun and relevant. To this end, she dropped units on sensation and perception; social psychology; and, thinking, language, and intelligence to condense the course to more of a survey-style course that "is not particularly academically demanding because my focus is more on wetting their

whistle." Nicole provided an example of the differences between AP and "regular" psychology by describing some of the content she covered in her "regular" psychology class.

> "...the regular psych class for sophomores, primarily, was much more of a personal psychology course, much more touchy-feely... yeah, not heavy on research, not heavy on brain or anything like that. It was a lot more getting to know yourselves and obviously using psychological principles to better... but I think we did a whole section on study skills and how to improve your studying, relationships, you know how to relate better to parents and teachers. It was a great class but it was pretty... it wasn't a science."

Nicole profoundly described the differences between the two basic approaches presented in the teaching of high school psychology literature. One approach was discipline-centered, a scientific-approach aimed at preparing students for college courses and a second approach, with a humanistic focus on personal adjustment, designed to be relevant and practical to a broad spectrum of students (Goldman, 1983; Kasschau and Werheimer, 1974). Today, AP Psychology is considered the gold standard of pre-level psychology and developed as a outcome of multiple studies that demonstrated high school psychology courses were largely based on personal adjustment and did not bear a resemblance to the scientifically oriented course in the college preparation track (Dambrot & Popplestone, 1975; Federici and Schuerger, 1976; Griggs, Jackson, and Meyer, 1989). Ostensibly, AP Psychology was designed to refocus the teaching of psychology from a social to a more scientific study of psychological content.

College Board Recommendations

A handbook published by the College Board outlined the AP Psychology course in the following sections: Course Descriptions and Topics, the AP Course Audit, 2004 Released Exam Excerpt, and 2008 Exam Materials. The Course Description and Topics section explains content areas covered by the AP Psychology Exam. Located in Appendix D are excerpts from the handbook that describe the content of the teachers' 'preferred' unit. The common unit of

instruction for all teachers was the Research Methods unit; therefore, I have included the following excerpt which describes the Research Methods domain to provide an overview of the unit and an example of how the College Board provides teachers with detailed content information about the units of instruction:

> "The scientific nature of psychology is made clear through coverage of the methods psychologists use to ask and answer behavioral questions. Emphasis is given to the experimental method and issues of appropriate experimental sampling and control. Other methods, such as correlational methods, descriptive methods, naturalistic observation, surveys, and case studies, are also covered. The generalizability of the different research methods is examined. Accompanying the coverage of research methods is information on elementary descriptive statistics used in analyzing data, such as measures of central tendency, variability, and correlation. The characteristics of normal and non-normal distributions are examined. Further, students learn how inferential statistics are used to evaluate the results of the scientific process. Students also learn about the many different fields within psychology and about the importance of ethics in both scientific research and the practice of psychology" (College Board, 2008b, pg. 4).

In the AP Psychology Instruction Manual for Teachers (2008), teachers are given specific directions regarding the content from the Research Methods domain:

> "Students also need to realize that the phenomenon a researcher is attempting to understand will determine the research method used in the investigation. You should compare experimental and correlational approaches to psychological research, addressing the pros and cons of each and discussing when they are most effectively used. Additionally, discuss the advantages and disadvantages of each research method, including the use of surveys, naturalistic observations, and case studies. It is also important for students to know the concept of control of variables in experimentation. When talking about how psychologists conduct research, you can help students understand how data are interpreted, using basic concepts from both descriptive and inferential statistics. Moreover, throughout your discussions of research methods you must always emphasize the ethical guidelines of psychological research, such as informed consent, confidentiality, "doing no harm," and so on." (AP Psychology Instruction Manual, 2008, p. 6)

By simply looking at the description of the content in the Research Methods domain one sees the scientific and statistical themes that permeate the content of the curriculum. The passage indicates what students are to know and be able to do with content from the Research Methods domain. Of the fourteen major content areas covered by the AP Psychology Exam, the Research Methods content area makes up between 8-10% for the multiple-choice section of the Exam. In other words, each year students can anticipate 8 to 10 percent of the 100 total questions on the AP Psychology Exam to come from this content area. This breakdown is available for each major content area so that teachers can prioritize the emphasis on different content areas.

Mapping and Articulating Goals – Connection to AP Psychology Curriculum

In order to teach an AP Psychology course, teachers must participate in a subject specific AP Course Audit in which the teacher develops and submits a course syllabus to authorize the use of the "AP" trademark. Schools and individual teachers develop their own curricula while their syllabi must identify common essential elements of effective college courses including subject matter and classroom resources such as college-level textbooks. The audit process is designed to provide: teachers and administrators with clear guidelines on curricular and resource requirements; examples for course organization; how to prepare for the AP Exam in Psychology; and, available resources for teachers. Despite individual autonomy in the development of unique syllabi and the scope and sequence of content delivery, teachers indicated the AP Psychology curriculum and the AP Exam strongly influenced their decision-making.

Students received syllabi that outlined the scope and sequence of the AP Psychology curriculum for the entire semester or year up to and including the date of the AP Exam at the

beginning of the AP class from all of the teachers. Teachers mapped their instructional activities to cover the content outlined in the "Acorn Book," the nickname of the AP Psychology Instruction Manual made available through the College Board and the AP Exam. Below, Jennifer describes the influence of the "Acorn Book."

> "I would say probably the College Board would be the biggest one and that's just the testing and what's in the acorn book so I know what I need to cover."

Within the "Acorn Book" is an outline of the recommended content in the different units of instruction and the estimated percentage of questions from each unit that will be on the AP Exam. Thus, teachers' decision-making for the scope and sequence of content coverage is closely connected to the "Acorn Book" and the AP Exam. As Sara describes:

> "I use the College Board breakdown of how much they are going to emphasize in each unit so that's why I said like kids always like altered states but I know that's only like one or two percent of the test questions and it's usually about sleep questions... so I cover it, but don't spend a lot of time on it because I know that it's not necessary for them."

Steve shared a similar perspective and spent time on units based on the estimated percentages of test questions from each unit. When there were factors that interfered with his delivery of the curriculum, he modified and adjusted the units with the lowest percentages. Additionally, Steve candidly shared that his decision-making is based on the Exam.

> "Yeah, I mean it's very much I've built off, I teach to the exam which is not necessarily... well, I guess in my opinion it is the right way to do it only because that's what these kids are here for."

In fact, for all teachers, the overall goal for students taking AP Psychology is to have a good experience and to be successful on the AP Exam. With the primary goals of good experience and student success on the Exam in mind, teachers felt responsible for covering as much content from each unit as necessary and utilizing different instructional strategies to

reinforce different concepts from each unit. However, teachers experienced tensions which profoundly impacted their decision-making with and for instruction.

Implementing the Schedule

For the most part, teachers' units of instruction were closely connected to the recommended content outline in the AP Psychology Instruction Manual and organized based on the percentage of questions likely to appear on the AP Psychology Exam. Thus, when there were factors that impacted planning and forced teachers to adjust, parts of units with the lowest percentage on the Exam were the first choice to modify. For example, the unit on States of Consciousness makes up two to four percent of the AP Exam; teachers' justified their adjustment in their instruction based on the curriculum and Exam. As Steve illustrates:

> "What I do is condense. I stay on the schedule so if I lose a day that day just gets packed in to... and it would depend on the unit. Let's say it's the consciousness unit, I'm more willing to just bail on it and move on because on the national exam is a low percent."

Teachers recognized the decisions they made with respect to the organization and coverage of the curriculum is challenging and understand that not all teachers will make the same decision. For example, some teachers simply cut equally from each unit instead of the units with the lowest percentage units in order to make sure all of the content is covered from fourteen units of the curriculum prior to the Exam in May. Jennifer shares her experience:

> "And that is hard, it is something that AP teachers, we all kind of have our own, I know there's some that spend more time on the units and then students have to be responsible for some of the chapters on their own. I choose the other way; I cut down a few days from each unit and we get through everything."

In all cases, teachers were constantly negotiating with their written schedule for content coverage and the needs of promoting students understanding of the content for the Exam. As a consequence, these negotiations profoundly impacted what teachers decide to prune from their

schedule in lieu of tighter control over content delivery and to "stay on track" with the course schedule leading up to the Exam date.

All teachers entered each unit with a core of teacher-selected content to cover and added a variety of different instructional activities, demonstrations, videos, and other supplemental materials designed to facilitate student learning. For the most part, the supplemental activities were generated from online resources or learned from teacher workshops – the exact experiences teachers prominently identified in the *Orientations to Teaching AP Psychology* section. However, teachers eliminated the activities designed to facilitate student learning in order to keep to their original schedule for content coverage. Sara, for example, clearly explains her decision rule for negotiation, "on a day when I had a presentation then usually what I do is I hit the presentation real hard at the beginning of the unit and then I have activities that supplement it and so they might just lose some of the activities because I have to stay hard and fast." Like Sara, Steve explains his decision rule but adds a caveat that all teachers tend to embrace – to make sure *they,* not the students, are responsible for covering all of the content.

> ...if something gets throw off right away that can disappear. It was just a teaching tool whereas I'll sacrifice a video clip that I was going to show and get more to the content through lecture. That's how I, I have everything set but that's how I'll adjust. I still, never have I had to make the statement that you're responsible for this."

Adherence to a prescribed schedule is difficult for AP Psychology teachers largely due to the amount of content they need to cover in a short amount of time. As a consequence, teachers relied on breadth of coverage to assure students were at least exposed to important concepts from each unit that teachers suspect may be future Exam questions based on their experience.

Category Two: Specific Curricular Programs and Materials

The second category of teachers' knowledge of the AP Psychology curriculum consists of knowledge of programs and materials that are relevant to teaching a particular domain of AP Psychology (i.e., research methods, development) and specific topics within that domain (i.e., standard deviation, Piaget's Theory of Mind). Examples of sources of knowledge of specific curricular programs consisted of four major categories: materials from the College Board; supplemental materials for content, instructional activities, access to internet-based resources, and the textbook and accompanying resources (see Table 4).

Table 4 – Sources of Curriculum for AP Psychology

College Board	Textbook	Supplemental	Technology
• AP Curriculum • Released AP Exams	Myers – editions 5-8	**Activities** • Thinking About Psychology • Activities Handbook for Teaching Psychology • Critical Thinking Companion **Content** • Forty Studies that Changes Psychology • Zimbardo Textbook • Discovering Psychology **Test-Prep** • Princeton Review • Barron's AP Test Prep	**Websites** • APA • TOPSS • Myers textbook website • Teach-psych **Communication** • List-serv

Several studies recommended strengthening the connection between teachers in the field and university departments, summer institutes for teacher training, in-service opportunities for teachers with professional psychologists, and calling on the APA to play a more decisive role in training teachers with programs of interest and value (Engle, 1952, 1967; Abrams and Stanley, 1967; Ryan, 1974; Anderson, 1965; McFadden and Pasewark, 1970; Noland, 1967; Epley and Schwerin, 1977; Wertheimer, 1973; Ragland, 1992).

Within the last several decades, programs were developed to update teachers on psychological knowledge: through National Science Foundation institutes; internet lists, such as PSYCH-NEWS that increase lines of communication among high school teachers; national standards from the American Psychological Association (APA); development of unit plans from Teaching of Psychology in the Secondary Schools (TOPSS); and, in 1992, the College Board introduced the AP Psychology Exam. These trends revealed an increase of resources for teaching psychology and interest in the subject; teachers in this study reported taking advantage of the resources currently available in a variety of mediums. According to the teachers in this study, the availability of resources increased and were frequently utilized for content knowledge development and instructional purposes.

Materials from the College Board

All teachers in the study mentioned the frequent use and strong influence of curricular materials available through the College Board. The AP Psychology recommended curriculum outlines the major objectives and themes for each unit of instruction. In addition, teachers are provided with an approximate percentage of the multiple-choice questions covered by the AP Psychology Exam for each of the fourteen major content areas. Teachers in the study incorporated the objectives into advanced organizers (i.e., study guides) for students. The

College Board also provides teachers with released AP Psychology Exams and Free Response Essay (FREs) for teachers to use for test preparation. Here Michelle illustrates the use and influence of materials from the College Board including the incorporation of objectives, awareness of the percentage of test questions from the unit, and previously released Exam questions:

> "I'm definitely aware of the curriculum and the percentage and it's actually on their syllabus – it's the regular green sheet. It tells them the breakdown and I provide them an overview of each chapter and again I provide study guides for them and just passed out one today on this unit. It tells them all the learning objectives and I use for the most part, on almost every unit test, I use an FRE from a past AP test."

It was clear from the perspective of the teachers that the materials from the College Board strongly influenced their decision-making for content coverage. On one hand, Jennifer mentioned the College Board materials informs her broadly so that she knows "what I need to cover" while Sara and Steve modified the amount of time spent on different units based on the percentage of questions potentially on the AP Psychology Exam. Sara provided a candid explanation of the influence of the College Board materials:

> "I use the College Board breakdown of how much they are going to emphasize in each unit so that's why I said like kids always like altered states but I know that's only like one or two percent of the test questions and it's usually about sleep questions... so I cover it, but don't spend a lot of time on it because I know that it's not necessary for them."

John indicated his unit-by-unit decision-making was less influenced by the College Board materials because of his knowledge of the AP Psychology Curriculum based on his many years of experience teaching and as a consultant for the College Board. However, he did post advanced organizers on his course website with the objectives for each unit along with a variety of different released AP Exams and example Exam questions for his students to access independently.

Textbook

Although the teachers differed to some degree with respect the classroom-based textbook, all teachers in the study used one of the editions of David Myers' *Psychology* (2008, 2009) or *Myers' Psychology for AP* (2010).

Supplemental Materials

To a great extent, the core content for all teachers' AP Psychology course was derived from the College Board's AP Curriculum and one of David Myers' textbooks. Beyond the core content, teachers indicated that a number of different supplemental materials were used in their classrooms including resources for content, activities, and test preparation. Below is a table of the supplemental resources explicitly reported by each teacher for instruction.

Table 5 – Teachers' Supplemental Materials Used in Classroom Instruction

Teacher	Content	Activities	Test Preparation
John	• Weiten - textbook • Glietman - textbook • 4 book shelves of textbooks	• Course website • Teaching Psychology Blog • Myers' online instructor resources	
Sara	• Forty Studies • Zimbardo – Discovering Psychology • Annual Editions • Weiten – textbook	• Teaching of Psychology • Myers' online instructor rescources	
Steve	• Myers' resource binder • Weiten – textbook	• Myers' online instructor resources	• Princeton Review

Michelle	• Zimbardo – Discovering Psychology	• Thinking About Psychology • Activities Handbook for Teaching Psychology • Critical Thinking Companion • Myers' online instructor resources	• Barron's AP Test Prep
Jennifer	• Bernstein – textbook • Zimbardo – Textbook	• Myers' online instructor resources	

The table is not an exhaustive list of the supplemental materials used by teachers as indicated by the empty columns for John, Sara, Steve, and Jennifer. Most of the teachers talked about or showed supplemental materials that were easily accessible, both physically and through recall, during the interviews. In general, the responses from teachers focused on supplemental materials they used during the units of instruction observed or materials they used with great frequency. It was clear that teachers used a variety of supplemental curricular materials to support their instruction even though they were not able to recall all of the materials used. Each teacher had binders and/or file cabinets full of supplemental materials for use in each unit of instruction and teachers pointed to different workshops where materials were obtained. Sara profoundly summed up the sentiment of most teachers when she stated, "I have things that I have forgotten to do because I've got so much stuff." However, in addition to print-based supplemental materials, it was apparent that all teachers actively sought and obtained supplemental materials from internet-based sources.

Technology

As indicated in the table of the previous section, all teachers accessed Myers' online instructor resources page available through Worth Publishers. Teachers were able to access chapter images, enhanced lecture power points, illustrations, and course modules to use for instruction with students. Of all the teachers, John was the most involved in accessing and distributing supplemental materials online through his roles as consultant for the College Board, webmaster of his course homepage, and moderator of a teaching high school psychology blog. Early in John's career he attended different workshops and summer institutes that focused on how to use technology in the classroom and to improve lines of communication with other teachers, groups, and organizations interested in sharing lesson plans and activities. Below, John demonstrates the role of the internet in sharing resources for the teaching of psychology:

> "...when I first started teaching psych we were islands, I mean psychology teachers were islands because we were the only or there were one or two of us in the building and we never met anybody else. Now with the advent of the internet... I [can] respond to two other teachers who sent me emails about the stranger paper because we posted that on the blog yesterday and people were like how do you do that. So, in today's world probably most of it is internet-based.

Coupled with John's "island" reference, Sara indicated she felt "alienated" as the lone psychology teacher at her school and mentioned being a member of a list-serv as a means through which she could connect with other psychology teachers from around the country. Jennifer and Michelle also mentioned membership on a number of list-servs helped guide them to different websites where classroom resources are available such as: APA, TOPSS, Society for the Teaching of Psychology, and the Office of Teaching Resources in Psychology found at teachpsych.org. At these sites, teachers can access peer-reviewed demonstrations, activities, lecture topics, handouts, audio/video, books and films, current events of psychology topics,

pedagogical resources, blogs, podcasts, assessment resources, and a variety of other supplemental resources for the classroom.

Corresponding with the first AP Psychology Exam in 1992 was the founding of Teachers of Psychology in Secondary Schools (TOPPS) which established a list of goals and objectives for the secondary school psychology curriculum. Specifically, TOPPS was formed "to advocate on behalf of high school teachers within APA, to give greater input to the development of programs and materials for high school psychology, and to provide a visible, national voice for teachers of psychology" (APA High School, 1992, p. 1). One of the first initiatives was the development of specialized, scientifically-based, five-day curriculum units. These units were based on chapters found in introductory psychology textbooks (i.e., sensation and perception, personality) and included: content outlines, critical thinking exercises, active learning demonstrations, list of audio-visual technology resources, and a reference section (Ernst and Petrossian, 1996). In collaboration with the APA, TOPPS facilitated the development and dissemination of curriculum through workshops. At these workshops, high school teachers and a member of the APA, as partners, "together and by design, workshop leaders demonstrated dozens of meaningful active-learning demonstrations and activities that the high school teachers in attendance could conceivably take back to school the next day and plug into the curriculum" (Ernst and Petrossian,1996, p. 257). The teachers in the study clearly indicated the utilization of the many supplemental resources available for instruction.

Knowledge of Students' Understanding of AP Psychology

This component of pedagogical content knowledge refers to knowledge teachers must have about students in order to help them develop specific AP Psychology knowledge. The *Knowledge of Students Understanding of AP Psychology* component includes three categories

of knowledge adapted and modified from Magnusson et. al (1999) : (1) requirement for learning specific AP Psychology concepts; (2) ascertaining student misunderstanding; and (3) areas of AP Psychology that students find difficult. The first category, requirements for learning, refers to teachers' knowledge about the students, school context, and student abilities as they relate to the development of instruction for the classroom. The second category, ascertain student misunderstanding, refers to teachers knowledge of the modes through which teachers gauge student learning. Areas of student difficulty refer to teachers' knowledge of the psychology concepts or topics that students find difficult to learn.

Category One: Knowledge of Requirements for Learning

This category consists of an analysis of aggregate student demographic and experience data derived from surveys that were administered at the beginning of the AP Psychology course. Additional information including school-level characteristics is discussed along with the teachers' view of the students' skills and knowledge. In the first section, I outline the findings from survey data to provide background information specifically about the students in the study. In the second section, school-level data were gathered from the state's governmental public education agency to provide additional information about the individual school's demographics, ACT scores, AP Exam scores to provide a greater understanding of the school context and environment in which each teacher worked. Included in this section is a description of the individual teachers' perceptions and beliefs about AP Psychology students' dispositions and skills in their respective schools. Based on teachers' knowledge and beliefs about students, I present an overview of the teachers' arrangement of instructional practices toward the development of student knowledge within the AP Psychology curriculum.

Demographic Information and Experiences of Students

Surveys were administered to participating students in the five teachers' classes in order to generate some basic demographic information. A total of 112 students self-selected the AP Psychology course and participated in the study. Participating students indicated their gender as female (n=70, 62.5%) and male (n=42, 37.5%). Students identified their race/ethnicity and the results were aggregated to white (n=96, 85.71%) and students of color (n=16, 14.29%). By grade level, the breakdown of students was recognized by sophomore (n=1, .09%), junior (n=69, 61.6%), and senior (n=42, 37.5%).

Additional questions on the survey aimed to gain some insight into the students' previous experience in upper-level math; experience in previous high school psychology; AP classes and with another AP Exam; and whether the student planned to take the AP Psychology Exam. A large majority of students indicated they had taken an upper level math course prior to or in conjunction with AP Psychology (n=79, 70.54%) compared to those students who did not (n=33, 29.46%). A small percentage of students identified they had previously taken a high school psychology course (n=20, 17.86%) while a large majority indicated they had not taken a previous psychology course (n=92, 82.14%). For a majority of the students, they lacked experience in taking AP courses and Exams. Just over three-fourths (n=85, 75.89%) of students indicated they had not taken an AP course offered at their respective schools compared to 24.11% (n=27) who indicated previous AP course experience. Likewise, a large majority of students revealed they had not taken an AP Exam (n=92, 82.14%) while 17.86% (n=20) indicated experience taking an AP Exam. On a brighter note for teachers, nearly ninety percent of students (n=99, 88.39%) indicated they planned to take the AP Psychology Exam at the end of the course compared to 11.61% of students (n=13) who did not plan to take the Exam.

These data demonstrate the students in AP Psychology classes were a homogeneous group with respect to demographics, upper-level math and high school psychology experience and experience with AP. Students in the AP Psychology course are not only novices in terms of prior or prerequisite knowledge of specific or topical psychology content, but also with respect to demands of an Advanced Placement course and AP Exam.

School Context

Results of the survey data revealed the students in AP Psychology, across research sites, are a homogeneous group among a variety of factors including: gender, race/ethnicity, grade level, previous psychology and upper-level math experience, and experience taking AP courses and Exams. Beyond demographic and experiential data of students, school context played an important role in the teachers' PCK in general and their knowledge of students understanding of AP Psychology specifically. There was some variation across research sites in terms of school schedule; two schools were on a block schedule for two quarters (Sara and Michelle) while three schools (John, Steve, and Jennifer) were on a seven period day with AP Psychology meeting the duration of the school year. Overall, the length of the Research Methods and "Preferred" units lasted from one to two and half weeks from introduction of the unit to the unit test. The teachers on the block schedule had units that lasted closer to a week compared to schools on a seven period day had units that lasted a little more than two weeks. Although John was on a seven period schedule, his unit duration was closer to the teachers on the block schedule and typically lasted a little more than one week.

All of the schools in the study had initiatives to promote AP classes and worked to expand the number of offerings across AP courses. Consistent with AP Psychology Test participation data for the state of Wisconsin, all teachers in the study experienced a steady increase in student enrollment in AP Psychology during their years teaching (see Table 6

below). In addition to being a popular course and exam, students in the state of Wisconsin have traditionally performed well on the AP Psychology Exam.

Table 6 – Total AP Psychology Exam Participation WI

AP Psychology Test Year	Total AP Psychology Tests Taken in WI	Total AP Psychology Tests with 3+ score	Percentage Passing
2009	5385	4335	80.5%
2008	5156	3895	75.54%
2007	4497	3475	77.27%
2006	4230	3325	78.61%
2005	3323	2631	79.18%
2004	964	813	84.34%

One teacher in the study, Steve, saw an increase of student enrollment in AP Psychology increase from 33 in 2005 to 170 in 2010. At Steve's school, along with the others, school-wide initiatives were enacted to increase student participation through encouragement and the expansion of AP course offerings. AP Psychology is among the most popular courses at the schools in the study and recent data released from the College Board indicate AP Psychology was the most popular AP Exam taken in 2010 by students in Wisconsin (College Board, 2010).

To accommodate the growth, the schools generally had open enrollment policies to AP Psychology although teachers mentioned each school differed in the degree to which the policy was enforced. For example, Steve, Jennifer, and Michelle mentioned their students' access to AP Psychology was established through "generic prerequisites" like earning an 'A' in freshman and sophomore U.S. and World History, having a minimum 3.0 GPA, or by virtue of being at a certain grade-level such as a junior or senior. John's school was unique in that it had an "honors" program in social studies for students and AP Psychology was the first AP class offered as an option to stay in the "honors" track. However, if spaces were open, AP

Psychology was accessible to all students and in instances where there were more requests than available spaces, additional criteria were administered for final selection of students.

Regardless of the path to AP Psychology, whether through a tracking system or open enrollment, it was clear that the AP Psychology course enrollment grew steadily for teachers in this study over the years. As a whole, the teachers pointed to a number of reasons they believe students take AP Psychology. For example, all teachers believe the number one reason students take AP Psychology is because they are motivated by the of possibility of earning college credit from a score of 3 or higher on the AP Psychology Exam. Teachers mentioned other reasons they believe students take AP Psychology including: the course "fits in the schedule," students are "familiar with the teacher," "peer or parental persuasion or recommendation," and that "AP Psych is a safe course to try AP."

Teachers Views of Students' Ability

Teachers recognized that a large majority of their students were novices with little background or prior knowledge of psychology subject matter and discussed perceptions of students in terms of having deficits in skills and knowledge. Sara, for example, described her students in terms of having low study skills, low vocabulary, and low levels of knowledge.

> "I don't have people who come in with the study skills, the knowledge base, the vocabulary... one of the biggest things... I've noticed in my years of teaching is the vocabulary is deteriorated. I have to define words that I never used to have to define because they are not reading as much."

In a second example, Jennifer shared a perspective similar to Sara in that she felt her students "did not have some of the basic skills necessary for success and consistently demonstrated low reading comprehension." Steve and John, on the other hand, shared the perception that their students' had difficulty applying information:

> John -"They are not very well prepared to apply it and so that is one of the hurdles that I have is getting them to take the information and apply it out into the world."

> Steve - "They might understand the definition but conceptually to apply it, to do the application of it we struggled."

Steve also added that each year he is amazed by the number of students that demonstrate poor writing skills on free response questions on his tests. Michelle agreed with Steve and noted her greatest challenge is "teaching students how to write free response essays." It should be noted that each teacher shared perceptions and beliefs based on their experience in previous years and at the time of the interview had not made personal connections with their new group of students. Thus, teachers' past experiences shaped their perceptions of student deficits in terms of skills and knowledge and played a formative role in their planning and approach to teaching AP Psychology in order to meet students' needs.

Teachers: Context, Students, Instructional Organization

Sara

Context

The school site where Sara taught was the largest school, with an enrollment of 2134 students, and the most racially diverse and economically challenged in this study. To illustrate, demographically the racial make-up of students was 50.4% white, 49.6% non-white and 58.2% of the students in the school were considered economically disadvantaged. Students at the school earned an average ACT score of 19.9 and only 6.3% of students took an AP Exam with 65.3% of students passing the tests with a score of 3 or higher. When asked to describe her AP Psychology students in terms of skills and knowledge, Sara mentioned her students have "low study skills," "low vocabulary," and "low knowledge."

Students

AP courses were promoted at Sara's school as a way for students to earn college credit while in high school. As a consequence, Sara's class enrollment was usually at a capacity of 30 students per section. Although she mentioned her school did not have an "official tracking system," she did admit that "once students began taking AP classes, they typically took as many as their schedules allowed." Some students, she believed, "took AP classes not only for the challenge, but also as a means of being in classrooms with other motivated students."

Instructional Organization

When asked to describe her planning and preparation, Sara emphasized the importance of getting through the curriculum and preparing for the test. To facilitate progress toward this goal, Sara provided study guides for each chapter, required students to take Cornell Notes on reading assignments, and offered extra credit to students who completed definitions for the vocabulary words in the chapters. The block schedule provided Sara with additional time to have students participate in various demonstration activities to promote conceptual learning and when asked, she provided numerous examples of her favorites lessons used in different units. In her classroom, she had file folders and binders full of different activities she collected over the years. Simulated testing conditions were the main form assessment as students took unit exams with multiple choice questions from released AP Exams and the test bank; in addition, students completed two Free Response Essays for each unit.

John

Context

Demographically, students in John's school were predominantly white (91.7%) with few students considered economically disadvantaged (9.9%). With a total enrollment of 1387,

students traditionally performed well on the ACT (mean: 23.5) and 85.3% of students who took an AP Exam in 2009 passed with a score of 3 or higher. These data corresponded well with John's description of the skills and knowledge students bring to AP Psychology. His students, traditionally," tend to have good study skills and are very good at learning facts and information; however, they are not well prepared to apply the information in context." At John's school, AP Psychology is considered the "honors" course for junior level social studies. Students were identified as "honor" students in their freshman year and took a track of courses with the same group of students. However, as enrollment in his course expanded, now just over half of the students came through the "honors" track.

Students

According to John, the students that enroll in AP Psychology are "highly motivated students that are looking to the challenge of taking an AP course" which, in his view, "are great to work with." His students also came in with prior knowledge from science and math class that enabled John to re-teach with students' prior knowledge.

> "Many of the kids will remember, they'll remember the neurons and so forth from biology; they will remember mean, median, and mode from stats – it's my job to refresh their memory versus teach it all over again"

John and other teachers assumed students would enter with prior knowledge from course that overlapped with AP Psychology; basic statistics from math and basic biology from science were the most often mentioned.

Instructional Organization

John described his planning as the development of a core curriculum which manifested in the creation of power point presentations, lectures, discussion topics, and other teacher-driven activities. In-class instruction was predominantly direct instruction, or in John's words, he

"presents a concept, tells a story." Thus, his lessons tended to be "very power point and technology-oriented" though he referred to the inclusion of supplemental activities, discussions, demonstrations, and video clips for instruction. Consequently, John acknowledged the "merit" for using cooperative learning groups, but did not incorporate the instructional strategy because of time:

> "If I can do something and cover 5 concepts in a day, that's a worthwhile thing for me. If I get into buzz groups for 20 minutes and they're basically dealing with two concepts that's a lot of time to devote to two concepts."

Access to and utilization of various technologies was an important element of John's pedagogical philosophy. For example, John managed a class website that housed all documents he distributed in class and links to supplemental websites associated with teaching and learning in psychology. In addition, John utilized communication programs online to inform students of assignments and tests through text messages and provides his students with a flashcard application (Quizlet) for their smart-phones. His core curriculum was set and "now it's not a matter of planning it's a matter of updating, changing, pulling a little bit out, putting something in" which for John meant, "finding ways to incorporate technology" in his instructional repertoire. Students were tested for each unit with a blend of multiple choice questions from John's previous tests that he made accessible to students through the class website and new questions from his vast test bank of questions along with Free Response Essay questions.

Steve

Context

At the time of the study, the total student enrollment at Steve's school was 1807 with a demographic make-up of the student body of 79.3% white students, 20.7% non-white students; 22.7% of the students were considered economically disadvantaged. On the ACT, students at

the school averaged 23.5 and the previous year, 14.2% of the students took an AP Exam; 80.7% of students passed with a score of 3 or higher. At Steve's school there was an initiative to expand the AP program and he witnessed enrollment increases by 500% in the last five years. Enrollment in Steve's AP Psychology classes specifically; he has increased from 33 in 2005 to 170 in 2010.

Students

In Steve's view, the expansion of enrollment in AP Psychology opened up the class to students who he described as "having difficulty applying information." Additionally, Steve referred to his students as "coming in with poor writing skills' as evidenced by his previous experiences with students. On a brighter note, Steve observed an increase in the number of students that came to his class with previous statistical knowledge from AP Stats.

Instructional Organization

Steve described his approach to teaching as a "storytelling" lecturer that "applied stories to his and students' lives as examples that described human behavior." The rationale Steve provided to his approach was that he needed to "prepare students for college." During class, he did try to incorporate some group activities and videos, but most days he spent some time in front of the class employing direct instruction with the support of notes and links on his Smart Board. Utilizing technology to supplement teaching was not something that came easy to Steve and he claimed he was limited by a "lack of creativity" in developing lessons that incorporated differentiated methods of instruction. Steve acknowledged, candidly, his limitations; he had spent time during the summer to improve his Smart Board notes and collected a repertoire of activities and demonstrations to use in the classroom. He conceded a desire to grow as an educator and move beyond his typical use of in-class time, structured around a review of

homework and readings, lecture, and supplemental activities. Steve's preference was to have students' complete higher-order thinking activities outside of class so that he could spend limited time in-class reviewing and checking in with students to make sure they understood the concepts. To check for student understanding, Steve developed a series of quizzes with questions that progressed in difficulty leading up to the unit exam. The tests consisted of multiple choice questions, drawn from previously released AP Exams and the textbook test bank, and Free Response Essays.

Jennifer

Context

At Jennifer's school total student enrollment was 1143; demographically the racial breakdown of the student population was 74% white, 26% non-white, and socio-economically, 13.8% of students were deemed economically disadvantaged. On the ACT, students averaged 23.6 and 16.2% of the students took an AP Exam with 69.5% of students earning a passing score of 3 or above. The school did not have system of prerequisites for admission to AP Psychology; however, Jennifer established a "generic prerequisite" and would only take juniors and seniors.

Students

In Jennifer's view, she believed AP Psychology was a course that differed from other AP courses in that a "more diverse range of students enrolled in the class"; those willing to give AP a chance through psychology. Consequently, Jennifer adjusted the focus of her teaching to "accommodate the growing literacy needs of students"; a deficiency she noticed in her students' skill-sets.

Instructional Organization

To gauge students' understanding Jennifer relied on students to initiate questions and ask. In addition, she had students do two quizzes for each chapter based on their readings. At the beginning of each unit, students were provided a packet that included a study guide and several higher-order thinking activities. Her classroom operated in a manner that provided her with opportunities to engage with students during in-class activities. At the beginning of each class, she had students review the previous night's reading in small group discussions which allowed Jennifer to interact and informally check their understanding. She then brought students together in a large group to clarify concepts before transitioning to activities; for each unit she tried to select five or six activities to do with her students in class. The organization of Jennifer's lessons provided students opportunities to review and apply concepts as a pre-reading activity prior to homework and other reading assignments. Students were quizzed with multiple choice questions over their readings prior to the unit test. For each unit, students were assessed on multiple choice questions from the textbook test bank and Free Response Essay from released Exams.

Michelle

Context

With a total school enrollment of 696, students at Michelle's school breakdown demographically as 89.6% white, 10.4% non-white and 15.4% of students are considered economically disadvantaged. The students at the school traditionally performed well on the ACT (mean: 23.8) and in 2009, 69.6% of students who took an AP Exam passed with a score of 3 or higher. For admission to AP Psychology, there were no prerequisites; most of her students took the Introduction to Psychology class out of interest, not as a requirement. AP courses, in

general, were encouraged and the school did not have an official or unofficial tracking system for students. Ultimately, the students at Michelle's school were afforded choices among a litany of AP courses in math, sciences, and the humanities.

Students

According to Michelle, AP Psychology seemed to attract the "widest range of students who were skilled in both sciences and social studies and for students who were willing to take a risk and try an AP course." Michelle described her students positively as being "self-motivated," having "a love of learning," possessing a "strong work-ethic and high expectations" and "creative" with a "sense of humor." To her, the course also attracted students because the content is "centered on learning about people and behavior" although she recognized other factors contributed to students desires to take the course.

Instructional Organization

Of the many duties required of teachers, Michelle felt her ultimate responsibility was to "come up with creative ways for students to learn." Toward this goal, Michelle's teaching beliefs were buttressed by a philosophy of active learning. Posted on her wall was an image of the learning pyramid that displayed a claim, unsupported by original research, that students learn only 5% from lecture and 90% from teaching. Regardless of the lack of empirical support, Michelle believed strongly in the notion that "students who teach their peers are more creative, engaged, and interactive which in turn translates into learning."

Outside of the classroom, Michelle encouraged her students to build a community through the class Facebook page for studying and general communication. Inside the classroom, Michelle was the only teacher in the study that assigned individual and small group projects to her students regularly. Many of the projects were assigned for each chapter and

scheduled throughout the duration of the course to correspond with each unit. For example, students were assigned small papers to critique chapters from the book *40 Studies that Changed Psychology*. In another major project, students were assigned a Magellean of the Mind: Very Important Psychologist, presentation. In this activity, students were designated one of several important psychologists according to their place in the curriculum (i.e. Piaget during the Development unit). Students were required to develop a power point presentation, an annotated bibliography, and a cliff's notes version about the psychologist, their theories, and contributions to psychology to distribute as a handout. Through this activity, students practiced the skills of: inquiry, presentation, and utilizing technologies. Quizzes and tests were administered regularly and Michelle approached these assessments differently than other teachers in the study. On quizzes, she allowed students to use notes derived from reading assignments and on tests, students could complete test corrections on missed questions for half credit. For the test corrections, students were required to give the correct answer in the form of a sentence and log where in the book the correct answer was found.

Category Two: Ascertain Student Misunderstanding

This category is specific to the interactions between students and teachers during classroom instruction. All teachers in the study mentioned class discussions and student-generated questions as the main mode of ascertaining student understanding during in-class instruction. Teachers also mentioned that from their previous experiences they have an intuitive awareness of how students' "body language" and "blank stares" indicated confusion and misunderstanding. Sara, one of the veteran teachers, shared a thought that encapsulated the sentiments of all teachers, "I don't know, I guess because I have been doing it for so long I don't even think about how I do it. You learn a lot by you know observing the students and I'll learn a lot more right after they take the first test and when we do activities." At the end of Sara's

quote, she indicates the importance and value of other modes than non-verbal student indicators of confusion and misunderstanding.

All the teachers in the study mentioned various forms of formative and summative assessments as the main means through which student understanding was ascertained. In addition, the teachers indicated when there was student misunderstanding, they try to connect the subject-matter or topics to previous lessons or students' experiences. In other words, all teachers re-teach or explain concepts by employing specific instructional components such as, providing examples/non-examples (to aid the learner in discrimination of salient characteristics or dimensions of a concept) or through analogies (drawing comparisons between something familiar and unfamiliar) and elaboration (expanding from a simple concept to a more complex or nuanced concept).

Another strategy teachers demonstrated throughout the course of observations and discussed as an important means of ascertaining student misunderstanding during interviews was an acute craft in fielding questions and probing individual students to demonstrate understanding in large group settings. Teachers frequently mentioned trying to foster a classroom atmosphere of "trust," "honesty," and "comfort" in order to promote student generated questions and discussion. John provided an example of how he facilitated the development and promotion of a classroom atmosphere of "comfort" during one of the interviews. I asked him questions about one of his interactions with a student who gave an incorrect response to a question:

> "somebody gave a quote/unquote wrong answer, probably it wasn't exactly what would fit the situation but it still was good and hopefully I look and just don't look and say it's wrong and move on. I try very hard to try to somehow infuse that into you were right."

Thus, a major element of teacher's craft in fielding questions was to facilitate a classroom atmosphere that encouraged student thinking and effort toward the development of

knowledge within specific topic areas. In another example, Steve shared examples of questions he asked students to check their higher-order understanding during a collaborative group activity where students had to design an experiment:

> "They have to design their own experiment here, but, you know, for instance yesterday I emphasized to them in class, you have to establish right away that your population is hyperactive children. ...the experiment is basically set up, you know, and they have to go in and show: Okay where's the sampling flaw here? What did that person do wrong, sampling wise? What did they do with in their assignment? And the big question is can they recognize what was done wrong? And the second part of the question is they have to correct it. How would you have done it correctly? And some of the kids don't...the article that you see on there with the flaw is it was an article, which talked about a bunch of flaws, and then it gave two sample experiments and you had to go in and do a check, a concept check?

The examples from John and Steve indicate their propensity to ascertain student misunderstanding in large group classroom settings whereas Michelle and Jennifer structured opportunities for students to work collaboratively in small groups prior to large group checks for understanding.

Michelle and Jennifer more than any of the other teachers in the study provided opportunities for students to problem-solve and respond to questions through think-pair-share and other collaborative activities where students were required to discuss answers and peer tutor before checking in with the large group. During class, Jennifer often demonstrated how she interacted with students during the check for understanding in the large group by volleying questions and answers; carrying, modifying, molding, shifting, and shaping the approximate answers toward the correct response. She viewed this interaction as an opportunity to encourage students and to bring together different ideas from the small groups.

> "With a lot of students I don't feel comfortable saying, 'No you're wrong.' So I always try and okay let's go further instead of saying okay that's not good, that's a crappy definition. So I think that's always my... There are some students that I can say no. But most of the students I just want to encourage them. They are trying. They are thinking. You know and all of them had parts of that they just didn't have it complete. So I guess I

> just thought let's keep going because I know that other groups came up with better operational definitions. So trying to get those out and add to it."

Michelle viewed small group collaboration as an opportunity for students to teach each other where they could "struggle with concepts safely and achieve deeper learning."

The means through which teachers ascertain student misunderstanding, through discussion, is important because it highlights a deficient component of PCK: Knowledge of Students Understanding of AP Psychology. Activities and various forms of formative assessments were based largely on task completion for a participation grade. Scores from quizzes and chapter/unit tests comprised the majority of "points" earned for assessment of student understanding.

Category Three: Areas of Student Difficulty

This category refers to teachers' knowledge of the psychology concepts or topics that students find difficult to learn. Generally speaking, teachers mentioned the majority of their students in AP Psychology experienced great success in school due to their ability to memorize information effectively; however, students struggled to apply information in higher-order thinking activities. The teachers pointed to dispositional issues such as "level of motivation" and "desire to succeed" as influential factors for whether students, would or would not, be successful learning the content in AP Psychology. What materialized from a review of the AP Psychology curriculum and teachers' lessons was the importance for students to develop a working vocabulary of terms and concepts. Teachers were quick to share an array of terms and concepts they believed students struggled to learn largely based on the questions they fielded from students during in-class instruction.

What emerged from the interviews with teachers were examples of students' difficulty understanding pairs of terms and concepts that were similar or closely associated. For

example, Michelle mentioned students struggled to differentiate between abstract concepts in her "Preferred" unit: Piaget's Theory of Mind and egocentrism; assimilation and accommodation; Kohlberg's Postconventional Morality Stage 5 – *Social Contract and Individual Rights* and Stage 6 – *Universal Principles*. Jennifer indicated students struggled to understand the difference between correlation and cause and effect in addition to when to use mean versus median when analyzing data.

John provided a salient explanation of students in his class who confused the definitions of a pair of vocabulary terms: random assignment vs. random sample. In this excerpt, John reflected on a moment during class when he highlighted AP Psychology students' typical mistakes made on the Free Response Essay (FRE) portion of the AP Exam based on his years of experience as an AP Reader:

> "I said those are the kinds of questions that separate a four and five. What I was trying to get across to them is there are a lot of things in psychology: assimilation/accommodation; introvert/extrovert; those matching… not manic depressive, but hallucination/delusions… there's a lot of concepts in psychology that students tend to mix up. And, independent/dependent variable is actually one of them that I didn't mention to the kids. Random assignment and random sample is one of those things that students tend to struggle with, if you will. Or they tend to mix up unless you point it out to them and what I was trying to get across to them was these are the types of things, concepts that they like to ask on the AP test. It's a subtle reminder that there's this test in May, that we have to worry about and also it's 'watch out for this' because this is where you can get confused. Make sure you distinguish the two. Now that I've set the framework for that I can keep doing that wherever it needs to be said in a unit.

In addition to being informative to his students regarding common mistakes he witnessed as an AP Reader on the FRE portion of the AP Psychology Exam, John used this teachable moment to keep the Exam on the minds of students as a priority.

John's professional experience unmistakably came to the forefront of his mind when asked to discuss areas of student difficulty which differed from all of the other teachers in the study who did not share his experience or expertise. Using this knowledge John was able to

anticipate student confusion and modify his instruction to incorporate additional analogies, examples/non-examples, and elaboration to facilitate student learning. Teachers with less experience talked about areas of student difficulty in more reflective terms of their own struggles conveying correct content information to students. For these teachers, the central issue was students "understanding the content well enough" and consequently, to be able to anticipate student struggles and provide other means to facilitate student learning. For Jennifer, she modified her in-class instructional activities while Steve was more in line with John in wanting to provide different examples for students.

Jennifer revealed her students struggled with understanding standard deviation and noted it is "the hardest to explain and the hardest for students to get." As a consequence of this recognition of her students' confusion, she selected different activities to facilitate student learning.

> "Well you know I have to be honest. I think I share the student's confusion with standard deviation, I mean through all my years of teaching. Each year I think I get a little bit better at understanding it myself, and a little bit better at explaining to the students. But I don't know I guess I used my thinking which was when I started going through some of the resources for this chapter to see what to update there were a couple of standard deviation activities that had students go through and figure it out. I thought, 'I don't know if I've ever pen and paper gone through this myself.'

Through this reflexive process, Jennifer established deeper understanding of standard deviation and additional ways of explaining to students the origins and meaning of a difficult concept.

> "So I did it myself and for me that helped me understand it a little bit because you know you're figuring out the variance first. So it helped me understand a little bit what that number was. So I guess I was hoping for some students that perhaps their thinking was like mine and just here's a number and this why we use it less those questions of wait there does this number come from? Why is it important?"

Ultimately, Jennifer was able to assist her students on two levels: 1) in the process of deriving standard deviation; 2) by providing additional information and examples.

Steve also struggled with teaching students certain concepts in his "preferred" unit of instruction – biopsychology. Below, Steve reflects on the challenges of teaching the interaction between the hormonal system and nervous system because he, himself, struggles to make the connection.

> "Well, overall I think there are still issues with the nervous system and I don't know if you heard at the end but a student came up and asked about action potential. I think that as much as we try to do examples and with the example in class that you were here for we try to get them to understand what action potential is and what threshold is; they still struggle with it. The hard part is, and I struggle with it, the whole interaction between the hormonal system and the nervous system and trying to get them to make that connection that they're working together. They confuse them and don't always get the connection of how they're working together which usually shows up on the test."

The challenge for Steve is teach the content in a way that is meaningful and relevant to his students first, and so they can apply their knowledge on a FRE for assessment.

> "I don't have a good example but when references are made to something neural but they drift into the whole endocrine side of it. They don't get it right because they discuss the wrong system. The limbic system, I don't know yet because I don't spend a great deal of time on it, we cover it briefly, limbic can sometimes be an issue. They might know what its function is but then when you do an application question they don't make the jump; especially the lower end students and that shows up on the free response. Or even reuptake, there's a question on reuptake in the free response and the question is did they understand, even though we went over the whole mimicking, agonist, antagonist, the whole axon terminal and how it worked."

These examples demonstrate a vital component of PCK – the knowledge teachers must have about students in order to help them develop specific AP Psychology knowledge. As evident in the examples of John and Steve, teachers with strong conceptual and detailed knowledge of the topics can easily draw upon this knowledge in teaching and provide connections and relationships to other topics through instructional components such as: analogies, examples/non-examples, and elaboration. Jennifer's example highlights the importance of elaborate organization of lesson planning for pre-active and interactive teaching wherein content is represented in multiple and meaningful ways.

Knowledge of Assessment in AP Psychology

This component of PCK was not present in the previous models discussed; however, Shulman (1987) described PCK as "the ways of talking, showing, enacting, and otherwise representing ideas so that the unknowing can come to know, those without understanding can comprehend and discern, and the unskilled can become adept" (p. 7). Hence, the *Knowledge of Assessment in AP Psychology* component refers to the means through which teachers gauge aspects of students' understanding of the knowledge that was delivered.

The *Knowledge of Assessment in AP Psychology* component consists of two categories modified from Magnusson et. al (1999: (1) knowledge of the dimensions of AP Psychology learning that are important to assess, and (2) knowledge of the methods by which that learning can be assessed. The first category, knowledge of dimensions of AP Psychology learning to assess, "refers to teachers' knowledge of the aspects of students' learning that are important to assess within a particular unit of study" (Magnusson et. al, 1999, p. 108). In this category, the content outlined in the AP Curriculum is of particular interest. The second category, knowledge of methods of assessment, refers to: "teachers' knowledge of the ways that might be employed to assess the specific aspects of student learning that are important to a particular unit of study" (Magnusson et. al, 1999, p. 109). Due to the high stakes nature of the AP Exam, teachers' assessment practices are modeled after the multiple choice and free response portions of the Exam.

Category One: Knowledge of Dimensions of AP Psychology Learning to Assess

This category refers to teachers' knowledge of the aspects of students' learning that are important to assess within a particular unit of study. Here it is important to first identify the extent to which assessments are influenced by the AP Psychology curriculum, released AP

Exams, AP-style test questions and Free Response Essay questions (FRE). There are two identifiable frameworks that outline the content and organization in addition to goals and objectives for teaching psychology at the high school level. The first is the AP Psychology Curriculum and second is the National Standards for the Teaching of High School Psychology. Throughout the 1970s and 80s, the APA approached the College Board about adding psychology to the list of AP subjects in its program. Multiple studies contributed evidence that high school psychology courses were largely based on personal adjustment and did not bear a resemblance to the scientifically oriented course in the college preparation track (Dambrot & Popplestone, 1975; Federici and Schuerger, 1976; Griggs, Jackson, and Meyer, 1989). After twenty years of lobbying, the College Board granted approval for psychology as an AP subject and the first exam was administered in 1992. Corresponding with the first AP Psychology Exam in 1992 was the founding of Teachers of Psychology in Secondary Schools (TOPPS) which established a list of goals and objectives for the secondary school psychology curriculum.

TOPPS played a major role, along with the APA's Board of Scientific Affairs and the Board of Education Affairs, in the development of national standards. In August 1999, the APA Council of Representatives approved the National Standards for the Teaching of High School Psychology (Maitland, et. al., 1999). The intention of establishing national standards was as a measure to hold students and teachers accountable and to legitimize high school psychology for fear that without, school districts would suspend introductory psychology classes from school's curricular offerings. Weaver (2002) suggested the value of national standards was to specifically address what a student is to be able to know and do after completing a course; an instructive approach that moves from what a psychologist is to what a psychologist is expected to know and do. Below is a comparison of objectives for the Research Methods unit from the

AP Psychology curriculum (College Board, 2010c) on the left and the National Standards for High School Psychology Curricula (APA, 2005) on the right.

Table 7 – Comparison of AP Curriculum and National Standards

Standard AP	Ntl Standard
1. Differentiate types of research (e.g., experiments, correlational studies, survey research, naturalistic observations, and case studies) with regard to purpose, strengths, and weaknesses.	**IA-3.3**: Describe and compare quantitative and qualitative research strategies. Performance Indicators- (a, b)
2. Describe how research design drives the reasonable conclusions that can be drawn (e.g., experiments are useful for determining cause and effect; the use of experimental controls reduces alternative explanations).	**IA-3.1**: Describe the elements of an experiment. Performance Indicators – (b)
3. Identify independent, dependent, confounding, and control variables in experimental designs.	**IA-3.1**: Describe the elements of an experiment. Performance Indicators – (a, b)
4. Distinguish between random assignment of participants to conditions in experiments and random selection of participants, primarily in correlational studies and surveys.	**IA-3.2**: Explain the importance of sampling and random assignment in psychological research. Performance Indicators – (a-d) **IA-3.3**: Describe and compare quantitative and qualitative research strategies. Performance Indicator – (c) **IA-4.3**: Describe the concept of correlation and explain how it is used in psychology. Performance Indicators – (a-c)
5. Predict the validity of behavioral explanations based on the quality of research design (e.g., confounding variables limit confidence in research conclusions).	**IA-3.2**: Explain the importance of sampling and random assignment in psychological research. Performance Indicators – (a-d)
6. Distinguish the purposes of descriptive statistics and inferential statistics.	**IA-4.1**: Define descriptive statistics and explain how they are used by behavioral scientists. Performance Indicators – (a-c). **IA-4.3**: Describe the concept of correlation and explain how it is used in psychology. Performance Indicators – (a-c) **IA-4.4**: Recognize how inferential statistics are used in psychological research. Performance

	Indicators – (a-d)
7. Apply basic descriptive statistical concepts, including interpreting and constructing graphs and calculating simple descriptive statistics (e.g., measures of central tendency, standard deviation).	**IA-4.2**: Explain and describe measures of central tendency and variability. Performance Indicators – (a-d).
8. Discuss the value of reliance on operational definitions and measurement in behavioral research.	
9. Identify how ethical issues inform and constrain research practices.	**IA-5.1**: Identify ethical issues in psychological research. Performance Indicators – (a-d).
10. Describe how ethical and legal guidelines (e.g., those provided by the American Psychological Association, federal regulations, local institutional review boards) protect research participants and promote sound ethical practice.	**IA-5.1**: Identify ethical issues in psychological research. Performance Indicators – (a-d).

All of the teachers in the study said they were familiar with the National Standards for Teaching High School Psychology but did not use them to inform their practice. Jennifer was the only teacher who mentioned using the National Standards for Teaching High School Psychology when her district required an extensive course outline with objectives. Instead, the teachers in the study used the AP Psychology curriculum to guide the establishment of dimensions of learning to assess[1]. Jennifer provided the most succinct explanation of the influence of the AP Psychology Curriculum:

> "I would say probably the College Board would be the biggest one and that's just the testing and what's in the acorn book so I know what I need to cover."

For Michelle, Steve, Jennifer and Sara, the AP Psychology Curriculum greatly influenced their decision-making, instructional practices, and consequently, what they chose to assess. Each teacher incorporated the unit objectives and percentage breakdown from the College Board in study guides for each unit. Generally, planning for units of instruction resulted

[1] A description of how teachers use the AP Psychology Curriculum is mentioned in the previous section of Knowledge of the Goals and Objectives for Students: College Board Recommendations,

in readings, assignments, and activities aligned with the AP Psychology Curriculum. Steve and Sara demonstrated their units were organized based on the percentage of questions on the Exam. Thus, there were factors that impacted their plans; they adjusted by eliminating parts of units starting with units that made up the lowest percentage on the Exam. Both Steve and Sara, respectively, provided specific details highlighting the unit on states of consciousness as an example of which unit were cut. Consequently, the adjustments made by the teacher cut opportunities for active learning in lieu of tighter control over the delivery of content in the curriculum.

> Steve - "What I do is condense. I stay on the schedule so if I lose a day that day just gets packed in to... and it would depend on the unit. Let's say it's the consciousness unit, I'm more willing to just bail on it and move on because on the national exam is a low percent."
>
> Sara - "I use the College Board breakdown of how much they are going to emphasize in each unit so that's why I said like kids always like altered states but I know that's only like one or two percent of the test questions and it's usually about sleep questions... so I cover it, but don't spend a lot of time on it because I know that it's not necessary for them So, I'm always thinking about the percentage of the test and that's what's guided how much time I spend on each unit.

Unlike the other teachers in the study, John did not describe a close connection of his planning to the AP Curriculum recommended by the College Board.

> "The Acorn book, the standards that obviously the College Board puts out plays an important role, but I don't want to call it - like it's the guiding force behind the units. I don't look and say, "the acorn book says that I must cover this therefore I better make sure I put it into the unit." I have gone through the book and the objectives and all those things that are part of the acorn book to see that if between the book or myself we've covered [the content]."

Despite being familiar with both frameworks for organizing curriculum, teachers exhibited a great degree of autonomy with respect to selecting goals and objectives for the different units of instruction. This point is made more apparent by the teachers verbally stated goals and

objectives for each unit of instruction. As illustrated by the excerpts in the table 7, teachers stated objectives for each unit that was more narrowly focused than the prescribed AP Psychology objectives.

Table 8 – Teachers' goals and objectives for the Research Methods and "Preferred" Units

Teacher	Research Methods	"Preferred" Unit
Michelle	1. "They need to understand the different perspectives or lenses through which we examine behavior." 2. "I want them to know the different methods that psychologists used to understand behavior." 3. "the experiment... and all of the vocabulary that goes along with that."	Development 1. "the big questions in development like continuity vs. discontinuity; nature vs. nurture; is it early childhood or later in life; are we the same or do we change." 2. "The five big theories – Piaget, Kohlberg, Erikson, Freud, Harlow." 3. "...developmental psychology as field." 4. "...different periods of childhood: early, middle, and adolescence." 5. "developmental milestones that happen at different ages."
Jennifer	1. "big picture things obviously would be the different types of research methods focusing on correlation, experiment with independent and dependent variables, and stats."	Development 1. "to look at development from pre-natal to death concentrating on physical development, cognitive, social, and moral." 2. "stage theories"
Sara	1. "the big picture, so we'll introduce the approaches – that's a big focus." 2. "...research – they need to feel comfortable with the terminology." 3. "...to understand how experiments work."	Social Psychology 1. "To understand experiments and research designs because there are so many good examples in social psych." 2. "all the major people and their studies."
Steve	1. "...experimentation is number one." 2. "...stats is number two."	Biopsychology 1. "I start with systems (nervous, endocrine, and focus 2 days

	3. "...to know the different methods of research	on the brain." 2. "...key people in the study of biopsychology."
John	1. "...to understand the basics of the scientific method; that the scientific method is not just experiments, it can be surveys, it can be correlation, all the different ways you can gain information." 2. "... to understand an experiment, analyze and experiment, and if I'm lucky critique an experiment." 3. "...stats... to understand that correlation is not cause and effect."	<u>Learning</u> 1. "to be able to see it in real life and be able to say that's operant conditioning or that's classical conditioning."

The extent to which the teachers' lessons followed their self-described goals and objectives is explained in greater detail in the findings from research question two in the next section of the dissertation. What is important to note is the difference between the objectives outlined by the College Board and those described by the teachers – the teachers' units highlight far fewer objectives in the Research Methods unit. Content coverage by the teachers was largely based on what teachers think are potential questions that might appear on the AP Exam. All of the teachers described, to varying depths, objectives to learn experimentation and the vocabulary associated with experiments. Consequently, during class, teachers focused several days of in-class instruction on independent and dependent variables along with operational definitions. This strong focus on experiments during in-class instruction trumped lessons on statistics and ethics and demonstrated teachers' control over what is taught; hence, the dimensions of learning that are important to asses.

> "The statistics part is only one or two questions. The research methods is like the independent and dependent variables and I feel like I've hit that well – this is a huge foundation, but like the standard deviation stuff, if they don't get it, if they don't understand ANOVA, I'm not going to worry about that."

John provided the most candid explanation of the decision-making process to include and exclude content from the Research Methods unit:

> "For the most part, I'll be straight-forward with you, for the most part I let the textbook take care of it. Yeah. I do not get into the distinction. I maybe will let my math colleagues take care of that. Why don't I? It's probably a conscious decision and I've never thought this through so I'm thinking off the top of my head. It's probably a conscious decision in thinking that that portion of the test is whatever percentage it happens to be and then when we divide out how much of its statistics it's probably going to be a minor role and so I'm guessing I looked and said 'if I'm teaching to the test, the kids may get one question wrong or possibly two questions wrong' and I guess I'll have to live with that versus taking the time to go through that."

It's important to note that John and Sara were not the only ones who described the decision-making process of what dimensions of learning are important to assess in this manner; all teachers described topics or concepts they dropped from instruction and thus placed on the students to learn independently during the units of instruction researched. However, teachers' assessment practices covered the breadth of content irrespective of whether the content was covered in class or the students learned independently. Assessment was based largely on providing students opportunities to practice the two methods of assessment consistent with the AP Psychology Exam: multiple choice questions and Free Response Essays (FREs).

Category Two: Knowledge of Methods of Assessment

This category of PCK refers to teachers' knowledge of the ways that might be employed to assess the specific aspects of students learning that are important to a particular unit of study. Findings from research by Paek et. al. (2005) of AP Biology and AP US History teachers practices demonstrate teachers assess students by focusing on multiple choice and free response portions of their respective AP Exams, use frequent practice tests, and promote

independent study. The teachers in this study also shared that their assessment practices provided students opportunities to practice AP-style Exam multiple choice and Free Response Essay questions on quizzes and tests. Michelle, for example, "tests students frequently" through a midpoint quiz of 25 questions based on chapter readings. At the end of the unit, Michelle administered tests of 50 questions and "allows students to do corrections." Corrections for Michelle can only be done on the multiple choice portion of the chapter test. Students can complete this by including a correct answer to the question in a complete sentence, explain why the new sentence is the correct response, and locate in the book the page number on which they acquired the correct answer. Students were also administered cumulative tests throughout the two semesters of AP Psychology. The first cumulative test covered chapters 1-4 the next covers chapters 1-6 and she kept "circling back adding the newly covered chapters." A Free Response Essay (FRE) was used from released Exams on all unit and cumulative tests. Michelle taught students how to use rubric and grades the examples provided in the AP Psychology Teacher Manual. After the first FRE, Michelle provided students with a grade and feedback and had the students self-evaluate to compare and reach consensus for final grade.

All of the other teachers in the study followed a similar structure for administering assessments by providing students multiple opportunities to take quizzes, have unit exams with AP-style Exam questions, and require students to complete FREs. Michelle was the teacher with the most elaborate assessment system that allowed for student corrections. There were some subtle differences among some of the teachers. Sara, for example, taught on a block schedule and tried to "simulates test conditions" in the 90 minutes by giving the students two FREs timed at 50 minutes and then gave the students the multiple choice portion of the test. Steve administered quizzes close to every three days for each chapter. The questions came from the test bank provided by the Myers' textbook; the first quiz contained "easy" questions and

then gave students "medium-level" questions for the second and third quizzes. Similar to other teachers, Steve administered FREs on the unit test and graded with the FRE rubric from the College Board and provided additional written feedback. Jennifer followed a similar structure to the others and differed in that she administered two quizzes per unit based on reading assignments prior to the unit exam. John differed slightly from others in terms of test preparation. Rather than administering reading quizzes during the chapter, he provided various released AP Exams and prior tests from his class for students to access through his course website. His unit tests were elaborately developed. Half of the questions came from a selection of questions from previous tests and the other half from new questions the students did not have access to. In sum, teachers consistently demonstrated assessment practices consistent with the findings from Paek et. al. (2005).

Research Question 2: In what ways does pedagogical content knowledge influence AP Psychology teachers' instruction of the Research Methods and 'Preferred' units of the AP Psychology curriculum?

Knowledge of Instructional Strategies for Teaching AP Psychology

This component refers to instances of how knowledge is transformed and represented during instruction to promote student understanding by focusing on teachers' content representations, professional and pedagogical repertoires, and knowledge transformation in teaching difficult topic-specific subject-matter (Grossman et. al, 2005; Hashweh, 2005). As such, the focus of question number two seeks to identify the content representations, repertoires and knowledge transformation of AP Psychology teachers to understand teachers' pedagogical content knowledge at a micro-level within topic-specific units of instruction. To this end, Hashweh (2005) suggests teachers' PCK develops over time as a repertoire of teacher

pedagogical constructions (TPC) which describe instances of interactions between and among different knowledge categories.

> "Pedagogical content knowledge is the set or repertoire of private and personal content-specific general event-based as well as story-based pedagogical constructions that the experienced teacher has developed as a result of repeated planning and teaching of, and reflection on the teaching of, the most regularly taught topics (p. 277).

Thus, teachers' PCK evolves through a process of teacher pedagogical constructions (TPC) which describe instances of interactions between and among different pedagogical content knowledge categories. Over time, PCK is a collection of teacher pedagogical constructions - the cases of repeated experiences of teaching a familiar topic and as such, is demonstrate through teachers' in-class instructional practices.

Through experience, a teacher may develop a repertoire for representing content and transforming knowledge of topic-specific subject matter in a variety of ways that interact with their knowledge of student difficulties and misconceptions. Accordingly, TPCs: "result mainly from planning, but also from the interactive and post-active phases of teaching; result from an inventive process that is influenced by the interaction of knowledge and beliefs from different categories; constitute both a generalized event-based and a story-based kind of memory; and are topic specific" (Hasweh, 2005, p. 277), The focus of the following section is to provide descriptions of teachers in-class instructional practices that capture teachers' TPCs from the Research Methods and "Preferred" units.

Sara –Develop Vocabulary and Note-Taking Skills Through Content Coverage

Research Methods

As previously mentioned, Sara's curricular goals were closely connected to the AP Psychology curriculum guidelines and the percentage of questions based on the AP Exam. Unlike the other teachers, Sara faced a challenge in that her school operated on a semester block schedule, so the entire AP course covered fourteen units of the AP curriculum in thirteen weeks prior to the Exam. One study on the relationship between schedule and student exam scores found students who are on a semester-long block schedule format typically obtain lower AP scores on the Exam (Smith & Camara, 1998). The pressure of covering the content allotted time was foremost on Sara's mind as she planned and executed lessons.

Sara housed a collection of worksheets, activities, and an annotated bibliography of articles and videos she gathered over the years from teacher workshops and the psychology teachers' list-servs. The Research Methods unit lasted for eight days and her teaching approaches and selection of instructional components was grounded in her belief that students needed to develop study skills and vocabulary. Thus, she organized and structured the unit with advance organizers (note templates) in outline form and began her teaching with direct instruction in the form of lecture to cover a breadth of content. She felt it was necessary for the students to be exposed to the content, particularly to develop an understanding of vocabulary terms and concepts before students can participate in demonstrations and activities that promote more active, higher-order learning.

> "Before they can do things they need to understand what they're doing so they have to have the vocabulary... so I have to get the content in – that's why I've gone to use those note templates, cause I can get through that much more quickly and then we can have fun and do some activities that compliment what they need to know"

Sara believed that students understand concepts better through participation in demonstrations and other types of active learning. Prior to any demonstrations, Sara selected

an expository teaching approach to provide students with definitions coordinated with an advance organizer. The components employed under this approach included elaboration and analogies to proffer students additional examples to build a working vocabulary. In one example, students listened to a presentation that covered different methods of research as she spent considerable time on the vocabulary of experiments. On the board, she wrote the definitions of independent variable, dependent variable, operational definition, control group, and experimental group. Using teacher-centered instruction, Sara shared an example from Sara's undergraduate experience in a study with two-way mirrors. As she outlined the experiment she asked the students to identify the different elements of the experiments using the definitions on the board. The students were then given an advance organizer with several vignettes of experiments and worked in collaborative groups to continue to identify different elements of the experiment (i.e., independent variable, dependent variable). During this time, Sara provided students with guided practice followed by two demonstrations the following day. One demonstration was a peanut shucking experiment and the other was a study of smiling vs. sad faces in a yearbook. For both, students were required to work to develop hypotheses and complete the experiment.

The approaches of expository teaching and direct instruction in addition to the components of guided practice, and demonstrations were replicated when she taught statistics. To teach measures of central tendency and measures of variability, she provided students with an advance organizer with data and examples of how to solve for each measure. Students were allowed to use calculators to compute mean, median, and mode while Sara maneuvered around the classroom to provide guided practice. The feedback provided by Sara was focused on following the formula in the example. At a convenient transition point, she called on students to share their heights. While she wrote the heights on the board, she asked the students to

calculate the standard deviation. For the practice computation of standard deviation, Sara required students to work independently. As the students worked, Sara mentioned to the students during guided practice specifically why standard deviation was important in terms of what they needed to know for the test:

> "...it's not important that you understand the formula; it's important that you understand the bigger the number is, that means the larger the spread of the scores, which tells you something about the data."

Sara followed up the activity by reviewing the students do not need to know how to calculate a standard deviation; rather, to know what a standard deviation represents in explaining data:

> "...you're going to need to know standard deviation; don't worry about the calculation - what does it mean if there's a high standard deviation."

Following the standard deviation exercises, she reviewed with students the difference between randomly selected subjects, random assignment, and random sampling from the notes students completed during her expository teaching. Using a statistics demonstration of M&M color distribution in fun size bags, she asked students to tally the colors from their bags in an advance organizer and to gather the tallies of ten other students in order to increase the sample size. The final tallies were then checked against the numbers of colors provided by the M&M Company. Taking the M&M activity and height exercise together, Sara explained what she hoped students would understand through practice and participation in the demonstrations:

> "I wanted them to understand standard deviation – the bigger the standard deviation the bigger the spread of the scores. They should find that out tomorrow cause I'll have the data from third and fourth block with the height. And then, hopefully the people that actually completed the whole M&M sheet will see that as their sample sizes got larger that the percentages were truer to what the M&M Company said the numbers were supposed to be. Random sampling and understanding how the more data you have the greater the possibility that your data is accurate."

Her intentions for student learning and rationale for using the different approaches and components for instruction were quite clear. Expository teaching and direct instruction

preceded collaborative work and demonstrations in order to facilitate the development of working vocabulary students could apply in later activities. What she expressed to students in the standard deviation exercise was messages based on the dimensions of learning she believed were necessary to assess. A similar message was expressed when she followed up with students on the M&M activity.

> "I don't want to have them freak out – a lot of them will freak out with all the statistical stuff – it's like such a small portion of the test – I'm not going to spend a lot of time worrying about that part of it… the statistics part is only, I bet one or two questions. The research methods are like the independent and dependent variables."

Drawing from her knowledge of the AP curriculum and assessment, she did not make the connections to the vocabulary explicit for students; instead focused on surface coverage.

'Preferred' Unit: Social Psychology

Sara adjusted the organization of the AP Psychology curriculum to follow-up the Research Methods unit with Social Psychology; her "preferred" unit of instruction. For Sara, moving social psychology to follow research methods allowed students "to reinforce the research methods" and to feel "comfortable with the terminology" by "applying it to a situation." Accordingly, Sara's objectives for the social psychology unit included: "to understand experiments and research designs because there are so many good examples in social psychology" and "all the major people and their studies." However, the first advance organizer student received detailed a different set of objectives than the ones articulated by Sara in the interview. Within the advance organizer Sara identified student understanding of terms and examples of social thinking, social influence, group influence, and social relations as the main goals for content coverage.

At the beginning of the social psychology unit, Sara combined her desire to promote vocabulary development and the connection between research methods and social psychology

through a project-based learning approach. This approach was a shift away from teacher-centered instruction, like the expository teaching approach used in the research methods unit, to one that was more learner-centered. On the classroom bookshelves were tens of supplemental textbooks, each with a small post-it-note on the cover. The students were asked to select one supplemental textbook, get markers and a big sheet of paper to complete a small individual vocabulary preview project. Each post-it-note contained one vocabulary word with page number and Sara explained directions to the students on the board: 1) create a summary of the topic; 2) explain at least one experiment; 3) reinforce vocabulary from previous unit; 4) brief presentation to class.

Because Sara's school operated on a block schedule, she had the ability to involve her students in small projects during in-class time. She felt it was important to "mix things up" so that her students would learn to be "responsible for learning on their own and from each other." This project also enabled Sara to teach several concepts important to the social psychology unit in an efficient manner and to interact individually with the students through cues, prompts, and corrective feedback as a teaching strategy during whole group instruction. With thirty students in class, presentation time was limited to three minutes per person. Even with limited time, the presentations carried over to the following day.

For those students who did present, they were able to cover several key concepts in the social psychology unit. One of the students presented on forming impressions and shared examples of how people attribute physical traits and social schema. During the presentation, the student shared research that investigated the correlation between affect and sarcasm. In this particular example Sara reviewed some of the key elements of correlation. "Remember that a correlation coefficient is between -1 and +1. Based on the data, is this a positive or negative correlation? Is it strong or weak?" She reminded other students to "make sure to include the

connection to the research method unit in your example. Apply the vocabulary." Another student presented on the concept 'group conflict' through an example of prejudice and symbolic racism. After a brief summary of the concept, the student shared a summary of an experiment where university teachers evaluated a flawed essay said to be written by a Black or White student. Sara engaged the class by asking students to "identify the independent and dependent variables" and "possible confounding variables." Several students were quick to raise their hands or blurt out answers in response to Sara's questions. The following day, Sara budgeted time for the carryover of remaining students to present their projects on social psychology concepts. Time was always of the essence for Sara and when the presentations were finished she immediately resorted to direct instruction to efficiently cover the additional content students needed for a collaborative group assignment completed in the next observation.

For the next observed class, the school day was shortened to a half day. Sara now faced a fifty-five minute class instead of her usual ninety minute class period. On this day, students were placed into teacher-selected cooperative groups. Their task was to review an assigned study from the *40 Studies that Changed Psychology* book and complete an advance organizer with questions. The students were divided into three groups and assigned studies on racism of Japanese post-WWII, Asch's study of conformity, and Loftus' study on the bystander effect. Prior to the students starting their assignment, Sara asked the students to turn over the advance organizer to write some notes. She reviewed the Milgram study of obedience from the previous day and focused special attention on several research methods vocabulary from the study. Specifically, she asked the students "in your groups identify the independent and dependent variables" and "what was Milgram's hypothesis for the study." The students discussed the variables and hypothesis briefly in their groups before reporting to Sara. As the

students presented back to Sara, she reminded students to "critique the different experiments and methods used" in their assigned studies.

After twenty-five minutes of collaborative work, Sara called for the students to focus their attention again to the large group and asked for a spokesperson from each group to share information. While the individual groups presented, the other students in class were asked to take notes in their advance organizer on all of the presentations. All of the spokespeople followed a similar pattern; first, they provided an overview of the study and second, they applied research methods vocabulary to the studies. After each presentation, Sara used the instructional component peer tutoring and called on one of the students to reiterate the summary and methodological issues of the study. Sara's role on this day was limited to giving directions and providing guided practice while the students worked in collaborative groups.

Sara traversed two completely different paths for instruction to teach the AP Psychology curriculum during in-class instruction; there was little consistency in the instructional approaches and components utilized in the research methods unit compared to the social psychology unit. In the research methods unit, the approaches and components were more focused on teacher-centered instruction while the social psychology unit was taught with more student-centered approaches and components. During the research methods unit, Sara primarily focused on the development of vocabulary through expository teaching and the use of advance organizers. She also utilized some components of instruction including the use of demonstrations to teach statistical concepts. However, the manner in which the research methods unit was taught illustrates her decision rule to focus on certain concepts more than others based on influence of the questions on the AP Psychology Exam. In the social psychology unit, Sara shifted from a teacher-centered orientation to incorporate more student-centered approaches to instruction. Whereas time and efficiency seemed to drive the pace and delivery of content in the research

methods unit, connections between units and student activity were the driving forces behind the social psychology unit. She employed a project-based approach with components of instruction that allowed students collaborate while learning.

John – Storytelling Lecturer and Technology Advocate

John discussed planning as the development of a core curriculum which manifested in the creation of power point presentations, lectures, discussion topics, and other teacher-driven activities. In-class instruction for John was predominantly expository teaching, or as John put it, he "presents a concept, tells a story." Thus, his lessons tended to be "very power point and technology-oriented" and, at times, included supplemental activities, discussions, demonstrations, and video clips. His transition to power point, as a primary presentation tool for expository teaching, evolved from his early years teaching using overhead transparencies and the chalkboard. With a core curriculum set, John constantly sought new ways of presenting concepts through expository teaching based on the belief that "now it's not a matter of planning it's a matter of updating, changing, and pulling a little bit out, putting something in."

More than the other teachers in the study, John utilized technology in every aspect of his teaching. Spurred by his participation in a variety of teacher workshops over the years, a seed was planted to use and implement technology both in and outside the classroom. At the beginning of the school year, John's first unit of AP Psychology was the Research Methods unit. Thus a portion of in-class time was used to promote and disseminate resources available to students through the class website. He often used class time to check with students on their ability to access the different resources available through the website for the study of AP Psychology outside of class. The available resources for students provided opportunities for independent practice outside of class. Independent practice was a vital pedagogical strategy for

John. In class, students were provided an advance organizer with important study questions and vocabulary for the unit and were always encouraged to check out other resources that John made available. However, most of what he provided for students was internet-based for independent practice. For example, John provided his students with text message reminders for homework, all in-class documents for download, and a free flash card application called Quizlet that students could sign up for and use online or via their smart-phones. Additionally, his website provided students with links to the textbook website and other AP Psychology-related sites of interest. For test preparation, he also provided students with examples of past tests. Access to previous tests played an important role in John's assessment practices: half the questions on his unit and cumulative tests are drawn from previous tests. In sum, John provided students with access to a variety of different resources for independent practice or self-directed learning outside of class. However, with all of the available resources, John acknowledged concern that it will take time for students to negotiate which resources will best facilitate learning.

> "... the fear I have is that I've given them so many things and the two main things they get is in-class and in the book and I can see them having a strong orientation to say I'm not going to worry about Myers, let's just look at the study guide, let's just do Quizlet."

Although he stressed the textbook as the main resource for learning, he did not want students to use it as their primary means of learning and thus hoped students would use the additional resources.

Research Methods

In-class, John primarily employed expository teaching as his main approach to instruction. The components of instruction John applied consisted of teacher-created analogies, teacher-created elaboration, and review. John primarily lectured and used lengthy power point presentations to support his lectures. His presentations evolved from text-based slides to

include more audio/visual stimulation to represent concepts. Some, but not all, vocabulary words and concepts were defined in his presentations; others were simply an image and students had to listen to the definitions or explanations. Most of his in-class time was spent guiding students through the application of the words and concepts in a psychology-specific context; in his words, "present a concept, and tell a story." For example, John wanted to cover all of the important vocabulary words that students needed to know for experiments. The power point slides in the background contained brief definitions of the different vocabulary words (i.e., independent variable, hypothesis, operation definition, etc.) and images of caffeinated products. He began by asking students, "What is an operational definition?" for the variables and measures in the experiment. Through the student responses and additional slides, John engaged his students with a lecture and asked questions that required students engage in higher-order thinking to apply the different concepts to a hypothetical, flawed experiment on caffeine and memory.

One of the deficits John described of his students is that they have difficulty applying information. His understanding of previous students' difficulties provided a rationale for using a flawed experiment of caffeine and memory:

> "I said, 'how can I make this work?' Well, I'm going to go and define what an experiment is and then I'm going to tell what's wrong with it. Well, let's start with a really bad one and slowly evolve it into something that's decent and all of a sudden at the end they realize how complex it actually is. I'm just checking for whether caffeine affects your memory. We're also doing informed consent; we're doing two groups; we've got another person in here conducting it and I think at one point I was just like, 'we need independent and dependent variable' and then I just kept playing with the example.

Consistent with the description of John's instructional strategies and approaches, his explanation demonstrates his preference for control of the pace and amount of coverage of content delivered through expository teaching. The flawed experiment example provided insight

into the process of cues, prompts, and corrective feedback John implemented during instruction; one that is teacher-directed toward the correct or best answers.

John is the sage in the classroom, a purveyor of knowledge, who theatrically acted out different points he tried to convey. During an explanation of the Hawthorne Effect, John sat in the middle of the room and acted like a factory worker that changed behavior while being watched as though he were in the study at Western Electric. The use of props, to "keep it alive, to keep the energy level up" during expository teaching was also important to John. At one point during a lecture he discussed confounding variables and grabbed a basket to act out a scene of a graduate student working on an experiment with lab rats in a T-maze while prompting students to come up with potential confounding variables in the study. Both examples demonstrate John's "present a concept, tell a story" expository teaching approach in addition to the manner through which he engaged students to "apply the concepts" through teacher-created analogies and elaboration.

The pace and direction of content delivery was tightly controlled through expository teaching and by periodically asking questions to students. In the aforementioned flawed experiment example, John was able to cover all vocabulary words associated with an experiment in half a class period. Control over the pace and direction of his lecture also allowed John to integrate his knowledge of the AP Exam to teach test-taking strategies to his students. His tangents often focused on providing students insights to prepare for the AP Psychology Exam in May. For example, in the caffeine and memory experiment that students dissected, he came to a part of the lecture where he recalled one of his experiences as a reader and table leader for the College Board at the annual assessment of the free-response essay portion of the AP Psychology Exam.

> "I said those are the kinds of questions that separate a four and five. What I was trying to get across to them is there are a lot of things in psychology… there are a lot of concepts in psychology that students tend to mix up... Random assignment and random sample is one of those things that students tend to struggle with, if you will. Or they tend to mix up unless you point it out to them and what I was trying to get across to them was these are the types of things, concepts that they like to ask on the AP test. It's a subtle reminder that there's this test in May, that we have to worry about and also it's 'watch out for this' because this is where you can get confused. Make sure you distinguish the two."

At varying intervals, John mentioned the AP Exam in May to his students and acknowledged that his involvement as a Table Leader and AP Reader for the College Board comes with benefits for his students.

> "The reading helps me to distinguish where a lot of times where students make those kinds of mistakes… Reading somewhere between 700 and 1000 essays, you see how students do mix that up and so obviously that experience has helped me find some things that students tend to mix up that I maybe wouldn't have noticed because I never ask a test question of it."

During the flawed experiment lecture, it was clear that John required students to have a baseline working knowledge of different concepts and terms which they could learn from independent practice through the textbook, class website, and/or through his presentations. In addition to basic definitions with limited text, the power point presentations provided students with images of relevant examples of concepts and vocabulary words. John "revamped" his power points in order to get "away from that mode of giving them (the students) the definition on the screen as they all sit and write and I talk and they turn off and then go to the next slide." During an interview, John brought attention to his power point slide for a single blind experiment; rather than a definition, the slide included a flash picture of three blind mice. Through direct instruction, John's lectures included cues, prompts, and corrective feedback as opportunities for students to apply the information by responding to questions in order to demonstrate an understanding of the key features and concepts of an experiment.

On a separate occasion, John focused in-class time of the Research Methods unit to teach descriptive and inferential statistics, again, through expository teaching. In order to teach central tendency, John displayed several slides with definitions of mean, median, and mode. After defining the words, he displayed slides with sets of numbers and asked his students to follow his example and practice how to calculate the mean, median, and mode. His questions were crafted to guide students toward the correct answer which were later identified by a color coded correct answers on the subsequent slides. In a second example, John displayed a slide titled 'Measures of Variability.' On the slide were two words, range and standard deviation. Range was described as the "highest score to the lowest" on the screen and by John as "the number does not tell you much." For standard deviation, the formula appeared on the screen followed by John's announcement to students that he "will not show" how to derive the formula; you read standard deviation as "how scores differ from the mean" as indicated by "the bigger the number, the more the scores differ from the mean." John then presented a slide with a table of different numbers from tests scores that included: mean, median, mode, standard deviation, and range. He then asked students to use the examples in the table and come up with ways to explain: "What do we know about the test scores from the numbers?"

Compared to the other teachers, John limited his teaching of statistics because he felt the students could learn through independent practice from the textbook. This was a conscious decision based on the proportion of questions from the Research Methods unit on the AP Psychology Exam.

> "For the most part, I'll be straight-forward with you, for the most part I let the textbook take care of it. I do not get into the distinction. I maybe will let my math colleagues take care of that. Why don't I? It's probably a conscious decision and I've never though this through so I'm thinking off the top of my head. It's probably a conscious decision in thinking that that portion of the test is whatever percentage it happens to be and then when we divide out how much of its statistics it's probably going to be a minor role and so I'm guessing I looked and said 'if I'm teaching to the test, the kids may get one

> question wrong or possibly two questions wrong' and I guess I'll have to live with that versus taking the time to go through that."

The quote demonstrates John's decision to leverage the number of questions that could potentially appear on the AP Exam with the amount of time it would take to cover such content or , in his words, to "develop the appropriate methodology in order for students to make distinctions" among the different application of statistics. Rather than spend time in the Research Methods unit, John's preference was to revisit terms like standard deviation in the intelligence unit and cover it in greater depth when he can attach meaning to IQ data and normal curves.

During an interview after the Research Methods unit, John mentioned that he was not able to include an M&M demonstration on sampling, an activity that was common among the teachers in the study. In lieu of the demonstration, John spent additional in-class time on the flawed experiment lecture, shared information about his testing format, and reminded students to check the website for sample tests. He acknowledged that his students seemed nervous about how they were going to perform on the exam based on the number of questions he fielded during the school day and the number of hits he saw online for the Quizlet flash card application. Complicating John's pedagogical decisions on how to most effectively utilize in-class time, John candidly recognized his students "don't like the unit" and "want to delve into psychology." In his view, this in turn seemed to motivate students to work and prepare outside of class with the resources John provided online.

'Preferred' Unit: Learning

For the 'preferred' unit of instruction, John chose Learning, a unit that focused on the "definition of learning; what is learning; with heavy emphasis on classical and operant

conditioning." According to John, the content in the unit was especially relevant to the lives of students and allowed him more opportunities to do application activities with students.

> "I have more of an emphasis on application than say the states of consciousness unit or the bio unit. I want them to be able to see it in real life and be able to say that's operant conditioning or that's classical conditioning going on... Other than the emphasis on application, there is always an emphasis on that, but I probably give more examples, do more application, more real-life situations and try to bring it home that way."

The fundamental difference between the Research Methods unit and the Learning unit for John; in the learning unit it is "easier to find examples that the kids can relate to" even though John acknowledged the "ability to come up with tons of examples in Research Methods," he felt the "students would be bored to death." John demonstrated great consistency with the Research Methods unit in the use of expository teaching as the main instructional approach and the inclusion of test-taking strategies and test-related information during class time to support students. However, in the Learning unit, John integrated classical and operant conditioning demonstrations, the analysis of audio/visual examples from popular television shows, provided analogies for concepts that were relevant to the lives of his students, and offered advance organizers with definitions and graphic organizers.

On the first day of the learning unit, students arrived to class with several sheets of paper on their desks. John began class by informing students of the upcoming cumulative test and did not mention the papers. Instead he focused on a detailed explanation of the three posted versions of previous tests on the class website for students to access for independent practice outside of classroom time. He emphasized the importance of reviewing previously administered tests because students would see half of the questions for old tests on the new test. John explained the upcoming cumulative test will consist of "75 questions; 37 old and 38 new questions from the first five chapters of the AP curriculum." During the explanation he explicitly provided the quantity of terms that were included in the test questions and

recommended that student study both the test questions and bold print terms; specifically "twenty-seven questions were about bold print terms." He continued to explain to students that he tries to choose questions they will need to know now and in May, for the AP Psychology Exam, "the cumulative test will focus on major concepts of AP Psychology" and that "the test was a way for students to show what they know." Overall, the presentation and explanation was meant to be motivational for students as they prepared for the cumulative test.

The teaching content portion of the lesson began with a review of the definition of learning, a reminder of an experiment about learning, and the difference between learning and performance from the previous day's power point; all through expository teaching by John. He continued by reminding students of four types of learning they were going to cover in the unit: insight, trial and error, classical and respondent. Abruptly, John stopped the review of types of learning and made his way to the file cabinet to pull out a bag of Tootsie Rolls. He walked around the room and without informing students of what he was looking for, indentified specific characteristics and rewarded some students with a Tootsie Roll.

> "Behaviors this year were feet flat on the floor and the other one was pen or pencil in hand. For the first four days they got reinforced with tootsie rolls as I go around at the beginning of the hour with a bag of tootsie rolls; if their feet are flat on the floor I throw a tootsie roll at them. On the fifth day, and this year it worked out perfectly because on the fifth day we started talking about shaping. On the fifth day they have to have their feet on the floor and have a pen or pencil in hand. Again I go around and then how that gets incorporated in is whenever I am talking about operant conditioning we bring up tootsie rolls."

With the close of the file cabinet door and the Tootsie Rolls put away, John transitioned back to the power point lecture and focused students' attention to insight and trial and error learning. Over the last several years, John modified his power point slides to include more visual representation of concepts and less text. For example, John explained insight learning by asking students if they ever experienced difficulty solving a math problem only to step away and

have an "a-ha" moment. Accompanying John in the background, on screen, was a picture of Archimedes in a bath tub trying to figure out if the king's gold crown was pure or if a jeweler cheated. For trial and error, John replicated the progression by asking students if they ever experienced trying to fix a problem on a computer and then, with images of Thomas Edison on the screen, shared stories of his "trial and error" with lighting filaments. He further demonstrated "trial and error" by handing a student a set of keys and asked him to choosing the right key for the door lock to the classroom. The examples of trial and error were then explained through images of rats in mazes and video games in the power point presentation. For both insight learning and trial and error learning, John created analogies and elaboration as components of instruction. Again, very little text was provided to students in the form of definitions; instead, students were presented visual examples of images to represent concepts and verbal stories during his lecture to students.

Next John shifted the focus of the lesson to classical conditioning and divided his presentation between an informal and formal definition of the concept to students. For the informal version, John said, "We're going to attach a stimulus, any sight, smell, sound, taste, or touch, and attach it to a reflex. For example, a light and attach it to a pupil dilating; a sound to hitting above the knee cap and your leg goes up." John made his way to the light switch and picked up a device that made clapping sounds. As an example for classical conditioning he stood at the light switch he turned the light off, made a clapping sound, and said, "Pupils get bigger." He then asked students to stare into a partner's eyes and watch to see if their pupils dilated. With students facing one another he made the clapping sound and several students, on whom the experiment worked, began to laugh.

Following the brief classical conditioning demonstration, John asked students to retrieve the piece of paper that was on their desks when they arrived to class. The sheet of paper

contained different vocabulary terms associated with classical conditioning on one side and operant conditioning on the other. He explained to students that he provided the definitions for students "to save time." In John's view, students needed to understand the definitions because the learning unit had a "big application component and students needed to focus more on the presentations and activities." Compared the Research Methods unit, where John did not provide students with additional resources in class; in the Learning unit, he provided students with several advance organizers: vocabulary sheets, a learning example flow chart that outlined a decision-making process for determining whether a behavior is classical or instrumental conditioning, a t-chart comparing classical and operant conditioning, a worksheet with several vignettes where students worked to identify the type of conditioning used, and a programmed learning review that required students to use the vocabulary terms from the unit in context.

When John taught classical conditioning in the past, he noticed that students struggled to understand the definition when presented at the beginning and willingly shared his decision-making process in the form of a story to the class. On the power point, John had multiple slides with images of Pavlov's salivation experiment and told the story of how Pavlov discovered the dogs' physiological responses to their conditions for the experiment. During the story, John referenced a slide with the formal definition of classical conditioning; the words response and stimulus in red. John asked his students to re-create the formal definition of classical conditioning by including salivation, bell, and meat powder from the Pavlov experiment on a separate sheet of paper. On the next slide, John showed the same definition with words in red followed by the correct examples from the Pavlov experiment in parentheses (i.e. response = salivation; stimulus = bell or meat powder) and re-read the definition with the terms from the Pavlov experiment instead of stimulus and response. This was one of the only examples of guided instruction in John's classroom – a modification of his lesson based on previous

experiences by which students did not reach a necessary level of understanding. As an example of teacher-created elaboration, John showed a video of original footage from Pavlov's experiment as a component of instruction. He extended the application of classical conditioning outside of the Pavlov example through analogies, or other real life examples such as: puff of air and kids blink; lightning and thunder strike fear in children; Jaws music or music in horror films as stimulus to induce anxiety; along with several examples of cartoons. Referenced together, these examples were used in the classical conditioning diagram which incorporated examples from Watson's Baby Albert experiment and video.

For operant conditioning, time was of the essence and John quickened his pace of expository teaching to focus exclusively on the efficient review of definitions of important vocabulary words and analogies of concepts through additional visual examples in his power point. He began with a picture of raccoons standing for food in his backyard on the screen and proceeded to tell a story of how he employed operant conditioning to train them. Along with the raccoon story, John incorporated references to the Tootsie Roll demonstration, Pavlov's dog salivation study, and studies of animals in a Skinner Box as he covered several important vocabulary terms for the Learning unit: extinction, spontaneous recovery, discrimination, and generalization. For each vocabulary term, John displayed images from the different studies on the power point during the lecture; prompted and cued students with questions; and provided feedback.

During the Research Methods unit, John recognized students' confusion over the differences between random assignment and random sample and spent time providing additional examples and details to student. In similar fashion, he recognized punishment – both positive and negative forms of punishment – was challenging for students. To address the confusion, John displayed an image of Homer and Bart Simpson on the screen and said,

"Punishment looks like the definition of reinforcement except for one difference, the word *decreases* strength of behavior instead of *increases* with reinforcement." The image on screen changed from Homer and Bart to a graphic that showed a two by two table (presented/removed by appetitive/aversive). As he referred to the table, he continued, "If the behavior goes up we must assume there is reinforcing; if the behavior goes down, we have to assume the consequence is punishing." John again referenced the Skinner box as an example in addition to an analogy of parents taking away things like cell phones, computer time, and other privileges that students may have experienced as contextual examples for each of the boxes on the screen. Throughout the lecture, John frequently referenced and incorporated the vocabulary terms and notes for operant conditioning in advance organizers the students should have completed through independent practice.

According to John, one of the key differences between the Research Methods and Learning unit was the emphasis on providing students "more examples," "more application," and "more real-life situations" to apply classical and operant conditioning in real life. Toward this aim, John provided students with visual examples in his power point presentations and an advance organizer with several pages of vignettes. In both the power point and advance organizer examples, students had to identify whether the example or vignettes were classical or operant conditioning and apply the appropriate vocabulary terms based on cues and prompts from John. Additionally, at two different points during the lecture, John showed his students clips from the popular television shows The Office and Big Bang Theory. For both clips, the students watched first and then responded to cues and prompts from Kent to identify whether the clip was an example of classical or operant conditioning.

These examples demonstrate the ways through which John transformed and represented the AP Psychology curriculum during in-class instruction. Overall, there was

remarkable consistency in John's instructional approach during in-class time for both the Research Methods and Learning units; expository teaching dependent primarily on teacher lecture. Within the Research Methods and Learning units, John demonstrated pedagogical constructions for teaching specific concepts during the units. The instructional components most employed during in-class time consisted of analogies and elaboration through power point examples and teacher-centered questioning with corrective feedback. Outside of class students were provided access to numerous resources John made available online for independent practice primarily in the form of study guides for readings, flash card apps, and test-preparation materials. Unlike other teachers, John was the exclusive purveyor of information and he modeled how to make connections among concepts by applying information in familiar contexts for students. From his professional experiences, he has developed a sophisticated system of resource distribution for students and utilized in-class time to model the application of information. He demonstrated a decision rule for inclusion and exclusion of content based on his understanding of the proportion of questions on the AP Exam that come from the Research Methods unit and was willing to leverage in-class instruction to cover certain content versus taking time to prepare students for nuances of the AP Exam.

Steve – Scaffolding

As a teacher, Steve relied heavily on the AP Psychology curriculum, AP Exam, and the classroom textbook. Thus, Steve described his decision-making process in selecting content for instruction as "anticipating what content I perceive is going to be tested on the national exam." He utilized different resources such as released AP Exams and other test preparation materials to inform his curricular selection.

Steve did not go "in-depth" when teaching certain concepts because he felt they were covered better in different units of instruction. For example, Steve did not teach the visual

representation of standard deviation during the Research Methods unit, but planned to cover it during the intelligence unit. In the following quote Steve demonstrated his knowledge of instructional strategies and curricular goals as a rationale for content coverage in a different unit:

> "I go much more in-depth on it related to that because I have an actual...when I look at SAT scores, or ACT scores, or intelligence tests, they can visualize, even the graphs I give, them rather than me just saying it's one or two standard deviations above or below, I show them the scores on how they fit within that."

Steve described his primary method of instruction as a "storytelling lecture" wherein he tried to "apply the meaning of the concepts and vocabulary terms to describe human behavior in the lives of people." However, Steve also demonstrated the inclusion of additional components of instruction such as: collaborative groups, demonstrations, authentic tasks, and elaboration through video clips with his SMART board. For example, Steve took time over the summer to enhance his SMART board notebook lectures by including a variety of short clips to explain different methods of inquiry such as, "things related to Piaget, Freud, that when I was giving examples of a case study, when I was giving an example of a naturalistic observation, there was a quick, well the naturalistic observation was Goodall." Each clip was selected because the length was less than two minutes and allowed Steve to efficiently get through the content.

Research Methods

In-class time was structured with a review of independent practice activities such as homework and readings, in addition to reviewing content delivered through expository teaching and demonstrations. For example, Steve assigned his students an authentic task that required them to collect masculinity and femininity scores from their peers as a quasi-example of survey. When the students arrived to class Steve quickly reviewed mean, median, mode, range, and standard deviation and how to calculate each. The students worked independently to check

their calculations and aggregated the class-wide data on the SMART board. Once these data were available, Steve began whole group instruction by asking questions of the data related to different concepts from the lecture the day before. For example, Steve asked the students "Which is a better measure of central tendency, mean or median for our data? Do you have a sample large enough? Did you randomly assign subjects? Were there ethical principles that we should consider?"

The students also worked collaboratively in a demonstration of an experiment on reaction time. Prior to the demonstration, Steve distributed an advance organizer for students to practice identification of independent, dependent, confounding variables and operational definitions in several experiment vignettes. For the demonstration, students worked in pairs to tally measurements from strips of cardboard that were dropped between fingers. Directions for the demonstration were clearly detailed in an advance organizer, but students did not always follow the directions and struggled with the concept, operational definition. He reviewed the answers with students though guided practice by cueing, prompting, and providing feedback to students. Steve reflected on how the opportunity allowed him to re-teach difficult concepts:

> "And we discussed that; I mean that experiment is set up to be attacked because it's not as detailed as it should be.... the biggest part of the discussion is why do you have and operational definition? Why do you have procedure? I have that so you establish your controls and very much got them to recognize that they're...they wrote in for confounding variables, things that should not have been confounding variables."

Steve had his students focus considerable time evaluating experiment vignettes and their own demonstration because of potential free response questions on the AP Exam; the same questions he uses on his own unit tests. The interaction of Steve's knowledge of students and knowledge of instructional strategies manifested in this example in that he believed his previous students demonstrated difficulty in applying concepts and in terms of their writing skills on Free

Response Essay questions. Thus, by including examples of flawed experiments in class he can better guide students through instruction:

> "You know its former national exam free response, but the one example is their given, you know there's two different ones I give them to think but the way it all is set up. I don't think they always get it because they get it wrong on here. The experiment is basically set up, you know, and they have to go in and show, okay 'Where is the sampling flaw? What did that person do wrong, sampling wise? What did they do with in their assignment?' And the big question is, 'Can they recognize what was done wrong?' And the second part of the question is they have to correct it. How would you have done it correctly? And some of the kids don't, they have to check that off, and that's to help them prepare for this. But yes, like I said maybe this group will be different, but I'm guessing after five years, they won't. Some of them struggle will with it."

In another similar authentic task, students were required to gather data and Steve demonstrated the visual representation of data with scatterplots and explained how to read statistics. This strategy was used to teach students about correlation. "Co-relation = the relationship between two variables; R= -1 to +1 is the correlation coefficient" was displayed on the SMART board and referred to in Steve's explanation of how to read scatterplots. He elected to include the authentic task coupled with direct instruction because students in previous classes tended to struggle with inferential statistics.

Steve's preference was to have students' complete advance organizers of higher-order thinking activities outside of class so that he could spend limited time in-class reviewing and checking in with students to make sure they understood the concepts. However, Steve imposed a strict adherence to his original schedule to cover the content and would cut activities he deemed "teaching tools" that took too much time; at a minimum, content was covered through expository teaching so that his students were not responsible for learning new content without first having it introduced in class.

'Preferred' Unit: Biopsychology

An aspect of Steve's organization and structure of his teaching was the incorporation of quizzes that increased in degree of difficulty and held students accountable for independent practice activities like reading the chapter sections for homework.

> "Well they have the quizzes, you know they have a quiz every like, every three days there's a quiz, and I tell them the quizzes become...I never repeat questions, but the quizzes come from the test bank, so I said they're similar, but you're getting more difficult questions, because I use the easy questions for quizzes, and then medium... I don't use a lot of the difficult questions, but more the medium ones. It's the same concept just making you do a little bit more of the application of it."

Through this assessment practice, quizzes structured to increase in degree of difficulty, his students practiced the skill of answering AP-style test questions with great frequency.

The assessment was part of the first lesson observed in the biopsychology unit. Students were assigned the independent practice activity of reading as homework in preparation for the quiz. When the students finished, Steve began teaching the definitions of neuron communication, cell body, dendrites through text-based direct instruction. Steve's approach was an example of his teaching philosophy as a "storytelling lecturer" that "applies concepts to human behavior." In the following quote, Steve provided an overview of how he enacts the curriculum of the biopsychology unit based on breadth versus depth of coverage and the influence of the AP Exam:

> "A lot of it is really skimming the surface, much as you heard today. I'm setting the stage so that when I am covering content in a later unit that there is overlap and rehearsal. The only stuff I cover that I didn't cover before is if it's on an exam and I saw that it was on a released exam, and then I put it in. Otherwise I play the percentages – you have 100 questions on there, if there is going to be one question on forebrain, hindbrain then I take my chances."

For each new concept, Steve displayed an image on the SMART board and chose elaboration and analogies as the components of instruction to provide students with greater

details and examples that connected to their lives. For example, Steve planned to include a demonstration in the lesson. Steve had his students stand directly behind their desks and mimic the different actions (i.e. raise arms, touch toes, etc.) Steve performed in less than one minute. The purpose of the demonstration was to teach students, through direct instruction: reflexes and the communication process of the spinal cord; and, the location in the brain where each direction and movement was received. His connection to the brain at the end was purposeful and set up the next set of slides on his SMART board that covered dendrites, axons, and neurotransmitters. Analogies were used to teach dendrites as "receivers - think football" and axons as "door knobs – in form." After individually covering each concept, he displayed an image of neural communication that included all the concepts. He incorporated myelin sheath and action potential in the presentation of message speed with the analogy of a row of dominoes falling. In one example, Steve tried to make a connection to his students by asking, "Has anyone ever touched a hot stove top?" Most of the students raised their hands and he then demonstrated the communication sequence tying in all of the concepts he presented with images.

He then asked the students to form a large circle in the room with everyone facing the same direction for a demonstration. The students obliged and Steve had the students put their left hand on the shoulder of person in front and close their eyes. When the students all had their hands on the shoulder of the person in front, he asked them to gently squeeze the shoulder of the person in front after their own shoulder was squeezed. He called on a person to start and timed how long it took for the connection to go full circle. Next, he asked the students to kneel if they were able and grab the calf of the person in front and repeat the same process. The students commented on the difference in the amount of time it took for the shoulder versus

calf squeeze. Steve asked his students, "Why do you think there is a difference in time?" Several students quipped, "It's the difference in length the message has to travel."

Steve began the second observation by reviewing a variety of concepts associated with the brain based on a computer simulation students completed the previous day. According to Steve, the computer simulation allowed students to "dissect the brain and visually see where things are and to learn different functions of the brain parts like the corpus collosum and thalamus." In his view, the "activity is a getaway from lecture to give them an apparatus to visually see the brain" and so that students can "manipulate the brain in ways that are not possible on the overhead." Specifically during the review, Steve used prompts, cues, and feedback to check what students learned from the simulation and to directly make connections from their learning to a series of articles that were assigned as independent practice. During the review, Steve did most of the talking and was the one who made the connections between parts of the brain and the key highlights of the articles.

With post-homecoming passivity permeating from students, Steve decided to transition to have the students work collaboratively on an authentic task and conduct an experiment. He introduced the experiment by mentioning the flawed experiment in the research methods unit and calling on students to share important features (i.e. vocabulary words and meanings) of an experiment. In the introduction to the experiment Steve reinforced the importance of following the procedure for replication and for the students to establish the operational definition in the experiment.

Students were handed an advance organizer with all of the necessary information for how to conduct the experiment. In brief, the experiment was set up to test the "competition task" of verbal interference with a manual task. Following a sequence outlined in the directions,

students balanced a dowel in both the left and right hands while silent and while spelling words aloud for a total of eight trials. After completing the experiment, students were required to write up a lab report. In the lab report, students had to include an introduction with hypothesis, research design with independent variable and dependent variable, and a discussion section with confounding variables. Upon completion of the experiment, students had to calculate the mean, median, mode, and standard deviation for the measurements taken. This activity was designed for students to rehearse and apply concepts from the research methods unit and show the overlap of the concepts with the biopsychology unit.

Steve asked the students to work in collaborative groups for the experiment and lab report. Upon securing group members, the students went to the hallway to complete the experiment since there was not enough room for 27 students with dowels in the classroom. As the students worked through the progression of tasks for both right and left hands, Steve went from group to group and asked students "Where is the location in the brain for balancing a dowel and spelling?" In addition, Steve asked individual students to make connections between the experiment and the independent practice readings as a review of important features of the right and left brain.

In these examples, Steve demonstrated the interaction among different categories of knowledge and various pedagogical constructions for teaching specific concepts. Of particular interest are the interactions between instructional strategies, students, and curricular goals. As demonstrated through his use of experiments and demonstrations, Steve illustrates an erudite understanding of scaffolding and the development of student learning and understanding through various participatory activities. In addition, Steve modified instructional activities to include the development of skills and knowledge for later transfer on the AP Exam through his connection of experiments with free-response questions.

Jennifer –Classroom Instruction that Utilizes Multiple Instructional Strategies to Promote Conceptual Learning as a Pre-reading Activity

Research Methods

Jennifer described her decision-making process in selecting content for instruction as breadth in coverage of all concepts in the unit and in depth with those that she cannot "rely on the book to teach." Her description demonstrated an interaction among different pedagogical content knowledge categories. In particular, her curricular goals and instructional strategies are informed by her knowledge of students' struggles with reading comprehension. One of the main resources for students is the textbook and as Jennifer considered the manner, in which different concepts were expressed in the text, she utilized in-class instruction to support students' reading. The manifestation this interaction of her knowledge of students' understanding and knowledge of instructional strategies is present in the following statement:

> "I would say well just that correlational studies, experimental design; I don't think they get independent, dependent variables just from reading. So those are things and I think in this chapter there are more things that sometimes I feel like I have to do an activity with where other chapters I maybe could spend more time on a particular subject."

Upon further reflection, Jennifer revealed an interaction of her knowledge of students understanding and knowledge of dimensions of learning important to assess:

> "...there's so many things that I think they're introduced to for the very first time and that really sets us up for the whole year. We talk about experiments and correlation studies throughout the whole year. So they're telling me a correlation is cause and effect in April we've got a problem."

The textbook was the primary resource made available for students and Jennifer prescribed a rigorous reading schedule for her students. As a result of her orientations to teaching AP Psychology and knowledge of student understanding, Jennifer differed from the previous teachers in the study in that expository teaching and direct instruction were not her

main approaches for instruction. Instead, Jennifer employed discovery-based learning, hands-on learning, simulation, and role play as the main approaches for in-class instruction. In addition, Jennifer structured and organized student learning through participation in a variety of instructional components: advanced organizer, student analysis of analogies, authentic tasks, collaborative work, cooperative work, demonstrations, elaboration, guided practice, independent practice, preview, reflection, and review. In-class instruction required active student participation to promote learning as a preview prior to independent practice of assigned readings. The goals and objectives were transparent and outlined for all students as they participated in class and explicitly connected to their readings.

> "I always try to do like I think you probably saw on the board, you know I always try to do the goal for the day, what we're working on. Then at the very bottom, I have their reading assignment and what that's about, you know, to understand statistics, to understand correlation. That's something that I picked up last year, just a simple thing that I could do that might help them. I always try and in my teaching oftentimes, I'm not sure exactly how it paired up I usually like to... The concepts that we're talking about in class they haven't read about yet. That's what they're reading about for that night."

Recalling previous experience, Jennifer demonstrated an interaction of knowledge of students and knowledge of instructional strategies which determined the organization and structure of her teaching and learning activities. For example, she asked the students from her class the year before to share advice to the next year's students. The advice most stressed and shared with this year's students was "read the textbook and keep up with the reading schedule." Comments and advice from previous students informed Jennifer to include two quizzes for each chapter in order "to hold students accountable for their reading and to emphasize the importance of keeping up with readings to her students." Awareness of the interaction of PCK categories for Jennifer made an impact as she modified the organization of her instruction this year.

> "I think it's just through years of teaching and realizing that... I just think that well some of the activities in psych I think lend themselves better to them not knowing what's coming, not knowing what's going on. Also that I knew for certain activities like I have to

> do this before they read it and I think just in evaluations from students at the end of the year that they liked that better. Otherwise they read and then just come in with questions and then we are doing more questions rather than demonstrations or activities. So I think it just worked out that way or evolved that's maybe the better way for my teaching, I guess."

Jennifer structured the organization of her lessons with relative similarity. When class begins, students were placed into collaborative think-pair-share groups to review the previous night's reading assignment. On the SMART board, Jennifer placed questions and prompts for students to discuss and interacted with the students to clarify and check for understanding. For example, the following sets of questions were displayed for students on the SMART board:

1) Write operational definitions for the following hypothesis
    a. Coffee makes people more alert
2) What is the difference between population and sample?
    a. Why do we use samples rather than using the entire population
3) Why is it important to use a random sample?
4) What are some things you would like to observe here at school? - leads into naturalistic observation assignment

After the students were given time to discuss their answers to the questions in small collaborative groups, Nicole brought the class together for whole group instruction and called on students to report their responses to the questions. Even if students were partially correct, Nicole skillfully parried their responses toward a best answer or example that led to the next set of questions. For example, in the first question, a student offered a response when called on, "Coffee as a caffeinated beverage" as an example of an operational definition. A second student offered, "two cups" to which Jennifer replied, "Yeah, quantity is important." A third student shared "alert should be defined by awareness of surroundings." Jennifer responded by saying "A reminder that with operational definitions, it is important to describe how to measure things like alertness," and summed up operational definitions from the students responses with "keep in mind that you should define this as how you can measure."

Jennifer transitioned to teach the concept hypothesis through a demonstration of the wording effect. Students were distributed a green and blue sheet of paper, each with two different survey questions. On the blue sheet the questions were: 1) Is the Mississippi River longer or shorter than 500 miles (the other group was 3000)? How long is it? Fill in the blank of how many miles. 2) Is the population of Argentina greater or smaller than 100 million (or 2 million)? What is the population? She collected the sheets and asked for a student volunteer to calculate the mean. Jennifer told the students the differences between the two sets of sheets and shared the hypothesis: higher numbers (from the prompt) will guess higher and lower numbers (from the prompt) will guess lower. As such, the data shared by the calculating students showed means for the Mississippi at 3909 or 808 depending on the prompt and 130,100,000 or 3.1 million for the population of Argentina.

Jennifer followed up the wording effect demonstration with a brief preview of new vocabulary terms (i.e., random sample, variance) through direct instruction using the SMART board. Students then applied these new vocabulary words in a sampling demonstration with fun size bags of M&M. Each student was handed a pack and asked to make a hypothesis about how many colors of M&Ms they would find in their pack. The procedure for the demonstration was the same as in Sara's class: count the colors and share the information with others. As the students tallied the number of colors, Jennifer assigned different students to collect full counts of individual colors. On the SMART board, she put up a spreadsheet and called on students to share their findings. "What is the total sample size," she asked? She then placed the numbers for each color provided by the company that makes M&Ms and asked "Which is more accurate: an individual bag or the class totals? Did you confirm or disconfirm your hypothesis?" The M&M demonstration was a preview of the chapter section assigned as independent practice for students.

Within the Research Methods unit, the basic organization of the content was similar to past years, but the some of the activities she selected were different. For example, Jennifer assigned a variety of different activities that required students to develop hypotheses and compute mean, median, and mode to compare different data sets. In a demonstration, Jennifer distributed playing cards to thirteen students and had them stand in the front of the room and asked questions to help students understand visually the mean, median, and mode based on the number on playing cards. Some students were pulled from the line up in order for students to see the change in measures of central tendency based on the addition or removal of numbers from a sample. After the visual representation, students worked in cooperative groups to compile and calculate data that was collected on an authentic task of data collection of number of household shoes. Students used an advance organizer with formulas and examples to calculate measures of central tendency. Throughout the demonstration and collaborative work, Jennifer made it a point to connect the purpose of the activities to the concepts they were designed to represent.

In her previous experience, one of the concepts students found confusing was standard deviation. This year she adjusted her lessons to include activities that required students to mathematically compute standard deviations. AP Psychology Exam test questions typically require students to apply, not compute, a standard deviation. For example, students are presented a list of numbers and asked which set of scores has the greatest standard deviation or given a normal distribution, mean score, and standard deviation and asked to approximate the percentage of test takers that score above or below a certain standard deviation.

In this example, Jennifer demonstrated PCK as influenced by the interaction of knowledge and beliefs from different categories: orientations, students' understanding, and instructional strategies. Recognizing students' confusion of standard deviation resulted in

Jennifer reflecting on her own content knowledge and the instructional strategies she selected to facilitate student learning.

> "Well you know I have to be honest. I think I share the student's confusion with standard deviation, I mean through all my years of teaching. Each year I think I get a little bit better at understanding it myself, and a little bit better at explaining to the students. But I don't know I guess I used my thinking which was when I started going through some of the resources for this chapter to see what to update there were a couple of standard deviation activities that had students go through and figure it out. I thought, 'I don't know if I've ever pen and paper gone through this myself.'

Through this reflexive process, Jennifer established deeper understanding of standard deviation and additional ways of explaining to students the origins and meaning of a difficult concept.

> "So I did it myself and for me that helped me understand it a little bit because you know you're figuring out the variance first. So it helped me understand a little bit what that number was. So I guess I was hoping for some students that perhaps their thinking was like mine and just here's a number and this why we use it less those questions of wait there does this number come from? Why is it important?"

This topic-specific pedagogical construction manifested in the representations Jennifer chose for her students by allowing her to connect standard deviation, as a concept, to visual examples that are replicated in subsequent units and through use the authentic data from student tests and heights. For example, Jennifer used a normal curve from the intelligence unit as a way of explaining the importance of understanding a standard deviation.

> "I used it and I used it with my first example... because yes I show them this is why standard deviation is important. This is why it helps to see visually this is the perfect bell shaped curve, which they've all seen before. Then I do, which I got the info from our stats teacher, I do height. She's given me the numbers for what the averages and what standard deviation is for men and women. So we use that and then I show them another example of intelligence so they can see like on the Wechsler what the standard deviations are."

Beyond visual representations, Jennifer developed new ways of interacting with her students to gauge understanding and promote deeper learning.

> "Then I didn't have the standard deviations but we then hypothesized and looked at and I said, 'okay if I find out the standard deviation for your class is it two, what does that tell

> me versus if it's a ten?' Again I kind of always go back to this because I just think for some students having a visual might help."

In the examples, Jennifer demonstrated a series of complex interactions among different knowledge categories. Although she was aware of the curricular recommendations and the AP Exam, her decision-making was considerably informed by the interactions among her knowledge of instructional strategies and students' understanding. Through her actions and words, a discursive process of understanding and reasoning toward the aim of providing classroom opportunities that facilitate student understanding was apparent.

'Preferred' Unit: Development

Jennifer selected the Development unit as her 'preferred' unit in the AP Psychology curriculum and focused her instruction on stage theories of "development from pre-natal to death, concentrating on physical development, cognitive, social and moral." From Jennifer's perspective, content in the Development unit was more applicable to the lives of her students and developed activities relevant to students' lives. In general, Jennifer structured the use of in-class instructional time similar to the research methods unit: review of assigned reading through guided questions and think-pair-share, brief presentation of new material, a performance-based collaborative learning activity, teacher-directed summary of the day, and elucidation of independent practice (usually in the form of reading assignment).

Consistently, as students entered the room, Jennifer displayed the daily objectives on the SMART board along with an outline of concepts or themes for the day and the in-class activities assigned. On the first day of observations, Jennifer covered content on physical and cognitive development related to Jean Piaget. Students began by working in collaborative groups to respond to guiding questions listed on the SMART board:

1. When does each stage begin: zygote, embryo, fetus?

2. What is habituation?
3. Give examples of how babies learning social interactions through their senses?
4. What ages is infantile amnesia present? Why?
5. What is the proper order of motor development?

Jennifer encouraged students to recall and retrieve information from their reading homework assignment, but allowed students to refer to their books if needed. As the students worked in pairs, Jennifer engaged with each group to check on progress and respond to any questions as a form of guided practice. Based on student progress through this form of interaction, Jennifer transitioned the students to a large group activity where she used note cards to call on students to share their responses to the guiding questions. During the exchanges with students on the guiding questions, Jennifer demonstrated several layers of teacher-directed scaffolding (guided practice) to steer students to make connections between the content in the development unit and previous units.

For the performance-based collaborative learning activity, Jennifer assigned students to groups and distributed several children's' toys. Originally, the activity was designated as an extra credit opportunity, but Jennifer realized students were not completing extra credit activities and decided to add it to her repertoire of in-class activities that were both active and required students to interact with each other and manipulatives. She asked the students to work collaboratively and respond to the following directions: "Demonstrate the concept of schema. Tell me how a child in the sensorimotor stage would play with the toy. Use the toy to show a child's mastery or absence of object permanence. How would a child in the pre-operational stage play with the toy? What would a child in the pre-operational stage think a parent wants for their birthday?" As the students worked collaboratively, there were two distinct aspects of student learning at hand: one, students physically demonstrated what a child in the various stages would do with the toy; and two, students discussed the answers and demonstrated higher-order thinking by connecting answers to examples from the book and class. To review

the main points of the learning experience and reinforce key concepts, Jennifer used her note cards to call on students to share to the large group what they discussed in small groups.

Jennifer continued the lesson by incorporating two additional instructional components to the lesson: elaboration and analogies. First, Jennifer showed students a manila folder to demonstrate schema and made connections to different attributes of toys the students used in the previous activity and through an example of schema based on gender from the previous chapter. Schema, as a concept, was then expanded to two other important vocabulary terms from the unit: assimilation and accommodation. Jennifer provided students a helpful retrieval cue: "Accommodation has a 'c' in it which stands for 'change' and assimilation has an's' in it for 'similar'." With the terms schema, accommodation, and assimilation present in the students working memory, Jennifer showed a video clip from the movie Monsters, Inc. and asked the student to describe the little girls' schema and decide whether the girl was assimilating or accommodating. It was clear from the students' reaction that they were familiar with the movie, but had not thought about the clip and its relation to content in the AP Psychology curriculum. After a brief discussion of the video with students, Jennifer continued by making an analogy asking: "How does your iPod use assimilation and accommodation?" Students obviously understood the question and application by sharing how songs are downloaded to artists' folders through assimilation or newly created (accommodation) if other artist songs are not present.

During the second day of observations, Jennifer began class with a preview of the day's objectives, major concepts, and activities displayed on the SMART board. On this particular day, the lesson focused on the social and moral development through the stage theories of Kohlberg and Erikson. The students started by working in collaborative groups for a think-pair-share activity to discuss guiding questions presented on the SMART board:

1. How has the timeframe for adolescence changed?
2. Why is puberty starting earlier?
3. What is happening with the teenage brain?
4. In Piaget's stages of cognitive development, what stage would all of you be in and why?
5. How might Kohlberg's last stages of his Theory of Moral Development be culturally biased?

Jennifer provided guided practice while the students worked collaboratively to answer the questions posed at the beginning of the lesson. When the students reached a completion point, Jennifer used note cards to call on students and share what their group discussed.

Compared to the previous lesson, the interaction and exchanges between Jennifer and her students as they shared answers from the think-pair-share activity involved a greater number of students. Thus, Jennifer seized the moment and allowed more students to share their thoughts and asked additional higher-order thinking questions for students to demonstrate their understanding of the concepts from their reading to other chapters and units. However, Jennifer did limit the amount of time spent in order to transition students to main instructional activity of the lesson: a role play activity based on Kohlberg and Erikson's stage theories.

For the role play, students were assigned randomly to eight groups of three or four and given a different age range to work with. In groups, students had to determine the age, name, and gender of the main character(s) in their role play. Specific inclusion of content from the unit was also required of the students. For example, students were required to determine which stage in Kohlberg's Theory of Moral Development their character was in and demonstrate how their character would think according to the Heinz Dilemma in their presentation. In addition, students used an advance organizer handout of Erikson's Stages of Personality Development from their unit packet to determine the stage of development for their character. The students were then asked to develop a script and role play for the class to demonstrate each stage in the different theories and provide their classmates with "more tips and retrieval cues for

remembering the stages." Jennifer provided students ample time to work cooperatively and divvy up the work among group members from script development through performance.

The examples from Jennifer's classroom represent the manner in which she represented the content of the AP Psychology curriculum during in-class instruction. The structure and organization of her instructional approach between the Research Methods and Development units was consistent and categorized as discovery-based learning; a broad method in which instruction is organized around a process of helping learners to discover a pre-determined model, concept, or proposition. Within each class period observed, Jennifer employed a variety of instructional components to facilitate student learning. Students received an advanced organizer in the form of a study guide at the beginning of the unit which included a notes outline and pages supplemental activities that promoted student engagement with concepts and vocabulary important in the units. Thus, students were able to preview the content from the two units prior to engaging in activities.

Jennifer structured her lessons to include multiple components of instruction during in-class time. Students participated in collaborative work during each class period to review readings from the previous day at the start of each class period in think-pair-share activities. Support, in the form of guided practice, was provided by Jennifer during collaborative activities. During the Research Methods unit, students completed authentic tasks of data collection and statistical analyses using shoe data after participating in a statistics demonstration. Consistently, Jennifer illustrated different concepts and vocabulary for the units through use of analogies and elaboration such as the flawed drug experiment in Research Methods and Piaget stages of cognitive development through toy play. For Jennifer, in-class time was arranged for students to actively engage with the content from the units.

Michelle –Tools, Strategies, and Activities to Supplement Direct Instruction with Content

Michelle described an approach to teaching AP Psychology that differed from other teachers in the study. Prior to engaging students with the content of the first unit, Research Methods, she allocated time to instill her philosophy of teaching and learning philosophy: to be "a guide at your side instead of a sage on a stage." It was clear from observations that Michelle fostered an affective classroom environment where students felt comfortable. Rapport and respect were present in her classroom as Michelle described her students' in a positive light as: being "self-motivated," having a "love of learning," and possessing a "strong work-ethic." For AP Psychology, she considered students as needing less support through content-focused direct instruction and described herself as "small group and project-oriented." Michelle empowered students to take control of their learning by guiding students how to "teach themselves and to teach each other" cooperatively by employing different tools and strategies for reading and study. She also assigned recurring assignments that students were responsible to complete individually throughout the semester; a reaction paper from students' supplemental reading of the *Forty Studies that Changed Psychology* and a biographical presentation project titled: Magellan's of the Mind - Very Important Psychologists.

Research Methods

Michelle shared messages from previous students' experiences in AP Psychology; their challenges and successes in the process and on the Exam to help drive home a message of ownership and responsibility. The unit began with students learning Bloom's taxonomy and the "Question in the Margin System," a reading strategy. After learning the background and procedures of the "Question in the Margin System," she involved students in guided practice and cooperative learning by assigning the chapter from the textbook on Research Methods.

Each student took notes on the chapter separately and was paired with a peer to compare how they used the strategy and discuss the notes they completed. The next day, Michelle continued to guide students through the practice of using the "Question in the Margin System," this time students completed and compared notes on a brief lecture on methods of psychological research. On the whole, during the beginning of the Research Methods unit, Michelle spent considerable in-class time "talking about how to read the textbook, how to answer FREs, the sort of front loading stuff I have to get them to be able to do to be prepared."

For planning purposes, Michelle acknowledged that she was "aware of the curriculum and the percentages" and explicitly provided the information for her students on their syllabus and for each unit study guide. According to Michelle, Research Methods content was deemed "foundational" and she aligned her content coverage and classroom activities with the recommended curriculum and Exam. In sum, the goals for the unit were succinctly outlined by Michelle: "The big question: nature versus nurture, the perspectives, the methods, experimentation, and all the vocabulary with experimentation." Some instruction of Research Methods content occurred though student opportunities to explore and practice with different tools and strategies for learning and reading. However, she provided students with some direct instruction through power point lectures on approaches and methods and several "applying knowledge" activities or as she concisely described the instruction during the Research Methods unit: "a couple of power points, a couple of applying the knowledge kinds of activities, and their quiz."

In one such "applying knowledge" activity, Michelle focused on the objective "to understand the different perspectives or lenses through which we examine behavior and come to understand behavior." After a brief power point lecture, she involved her students in an analysis of a vignette of an alcoholic through a framework with three levels of analysis: social,

psychological, and biological. For the second objective: "to know the different methods that psychologists use to come to understand behavior," Michelle also briefly used direct instruction to present a power point lecture and lead a discussion with students on the advantages and disadvantages of each method used by psychologists. Two critical thinking activity advance organizers were assigned during class to accomplish Michelle's objective to cover "the experiment and the different vocabulary." On the advance organizers, students were provided vignettes and abstracts of different psychological studies and worked with partners to "identify operational definitions, dependent and independent variables, and flaws in the research design." Finally, students were exposed to the nature versus nurture question as a theme that would be analyzed in throughout the different units of instruction.

Although not initially mentioned by Michelle as one of the objectives for the Research Methods unit, she did focus on statistics for an overlap of two days. Students arrived to class and were handed back quizzes from the previous day for review. As students perused through their open-note quizzes, they openly sought clarification and correct answers from Michelle on questions they answered incorrectly. In response, Michelle employed reciprocal teaching and called first on students who got the answers to questions correct to explain how they arrived at the answer. While students shared answers, Michelle located slides on her power point presentation to show visual representations of concepts to re-teach certain concepts. For example, one question students struggled with asked about the accuracy of correlations between self-esteem and body weight. As the students discussed the answers, Michelle showed students examples of scatterplots on the SMART board and reminded students the difference between experiments and correlational studies is that one explains and the other predicts.

Michelle and engaged with students in a series of questions that provided an opportunity for Michelle to review correlation, an important concept from the unit.

> Michelle: "What is a correlation coefficient?"
>
> Student: "The closer to positive one, the more it correlates."
>
> Michelle: "It can be positive or negative one. What if it's zero?"
>
> Student: "They don't correlate."
>
> Michelle: "Right, it means there is no correlation. Remember, a correlation emphasizes the strength of a relationship. The question is asking which is the strongest; the furthest away from zero."

Based on students' reactions, correlation was better understood after some reminders from Michelle and visual representation of scatterplots. For other questions students discussed, Michelle asked students to re-word the questions with information from previous "applying knowledge" activities. One of the quiz questions asked students to choose among options that was an analogy to cause and effect. Michelle quickly reminded students that "cause is what a researcher manipulates" and "effect is what is being measured." A few days earlier, students completed a critical thinking advance organizer where they had to identify the independent, dependent, and confounding variables, operational definitions, hypotheses, and flaws in several examples of research vignettes. As the students struggled with the analogy question from the quiz, Michelle asked students to think about the "colorful boss example and use the blanks for blue and yellow cubicle and productivity."

Michelle continued to draw students' attention to different examples from activities they completed earlier in the unit; a strategy designed to provide familiar examples and add context to the questions students were answering. When the questions and discussion slowed, Michelle showed a slide on the SMART board with all of the students' quiz scores. She asked the students to write down all the quiz scores from lowest to highest. While the students copied

the scores, she asked students to find the mode, median, mean, range, and standard deviation. The objective for Michelle articulated to the class: "use chapter one quiz results and calculate measures of central tendency and variation."

As the students worked, Michelle displayed "descriptive and inferential statistics" on the SMART board and said to students, "descriptive statistics provide a picture of patterns from the data. What's an inference?" A student replied immediately, "you see a set of data and make a generalization" and Michelle added, "Inferential statistics generalize to a population or support a hypothesis." Michelle then linked from the SMART board to a Psych-Sim website, a resource tool Michelle used for teaching students statistical concepts. Using relevant student-generated data, Michelle distributed an advance organizer with guiding questions and modeled the functions of the Psych-sim tool for students. The students only interacted with the data on the advance organizer however; the website was accessible to students outside of class as a resource to help learn statistics.

To begin the exercise, Michelle transferred students' quiz scores to a data entry box on the website. The scores reorganized from lowest to highest and Michelle chose the display function to show students a histogram of student quiz scores. With the histogram as the first visual representation, a series of questions and responses started between Michelle and the students about skewness, bell curve, standard deviations, and other statistical terms. To illustrate one of Michelle's examples to teach students the concept of skewness, she displayed a graph on the Psych-sim titled: The Problem of Extreme Scores. Picking up on non-verbal cues of confusion from the students, Michelle provided students with an example of Bill Gates' income to illustrate the difference between median vs. mean income in the United States.

Measures of central tendency were also displayed in the Psych-sim and Michelle explained briefly the difference between range and standard deviation. For the final activity with statistics, Michelle explained standard deviation as "the average difference in scores" and distributed a sheet that showed students how to calculate standard deviation by hand. With the quiz scores, the students worked collaboratively to calculate the standard deviation using a chart from the sheet that included raw scores, mean scores, difference scores, and the standard deviation equation. When the students completed the task, Michelle shared the correct answer on the board and reminded students to make sure to take the square root of the answer as the final step. In closing, a brief discussion took place between Michelle and the class to wrap up standard deviation and to quickly mention the concept "statistical significance":

> Michelle: "Why is standard deviation important?"
>
> Student: "It shows the range."
>
> Michelle: "Yes, when the sample averages are reliable and the difference between them is large, you have statistical significance."
>
> Student: "When you use standard deviation, do you want to use a lot of different numbers?"
>
> Michelle: "How different the results are will show whether the data is statistically significant."

Michelle reminded students to access the Psych-Sim online and play with the data to become familiar with statistical concepts prior to the unit test (the next day). Through quizzes, students were exposed to the types of questions that would appear on the unit exam. In addition, Michelle believed it was important to provide "information about the Free Response Essay questions (FRE) on test and the AP Exam including how to write and how the FREs are assessed according to the rubric. To help facilitate student understanding of the expectations required of the FRE questions, all of the students were distributed a handout from the AP

Instruction Manual with example response from the 2003 AP Psychology Exam and an AP Reader rubric to assess the essays. For Michelle, this activity provided students with an opportunity to review essays from the perspective of what is expected of students through the process of completing essays.

'Preferred Unit: Development

Michelle selected the Development unit as her 'preferred' unit in the AP Psychology curriculum and focused her instruction on "big questions in development like continuity versus discontinuity; nature vs. nurture; is it early childhood or later in life; are we always the same or do we change" along with an introduction to the five developmental theories of Piaget, Erikson, Kohlberg, Harlow, and Freud and developmental milestones. Similar to the Research Methods unit, Michelle began the Development unit by distributing an advanced organizer in the form of a study guide sheet with unit objectives and guiding questions. The approaches taken by Michelle for the unit were student-centered because most of her students had "background knowledge" and were "familiar with concepts" from taking Introduction to Psychology the previous year. Specifically, Michelle employed discovery-based instruction and project-based learning approaches to classroom instruction in various forms during the Development unit.

One of the discovery-based assignments that Michelle assigned throughout the course was titled Very Important Psychologist (VIP). In this assignment, students were assigned an important psychologist from each unit and were required to develop and present to the class a power point presentation, a guided notes sheet, and an annotated bibliography. With Michelle's focus on five major theorists in the Development unit, there were several student presentations that accounted for a majority of the observation time. In-class instruction was organized to allow for student presentations and the students did a majority of the teaching; the embodiment of

Michelle's "guide by your side and not the sage on the stage" philosophy. Not only did the individual students demonstrate deep learning of the psychologists, they also showed various attributes that Michelle felt was essential for learning in her classroom: intrinsic motivation, responsibility, strong work ethic, accountability for self and others.

In a second example of discovery-based learning, Michelle assigned a role play activity that required students to engage in a process to discover and apply different concepts and vocabulary associated with stage theories. Students worked in collaborative groups to create and perform a role play in class from a list of Piagetian concepts (i.e., theory of mind, conservation, assimilation, etc.). As the students worked to create the role play, Michelle was available to guide students through difficulties and respond to different questions. Prior to the students' performances, Michelle asked students in the audience to guess which Piagetian term was demonstrated in the role play.

Throughout the Development unit, the ownness of learning fell directly on the students through inquiry and project-based assignments and through social interaction among students during performance-based assessments. The capstone assessment for students came in the form of a treasure chest project. In this activity, students had to collect artifacts that were symbolic of developmental periods in their own lives and interview parents and relatives about different critical periods connected with the stage theories. Students presented their treasure chests, engaged in discussions, and completed an instructional game to review concepts and vocabulary associated with stage theories in the Development unit.

The pedagogical choices Michelle made for the Development unit were consistent with her educational philosophy, "I prefer to come up with ideas where the kids can learn from each other and I can be the guide by their side." Students participated in discovery-based and

project-based instructional activities that emphasized understanding and application of concepts and terms from stage theories in the unit. In addition, students engaged in collaborative work to complete an in-class role play of Piagetian terms and in an instructional game to review concepts from the different stage theories. There were noticeable differences between the Research Methods and Development units wherein the Development unit was more student-centered and required students to engage collaboratively during in-class activities, demonstrate understanding through performance-based assessments, and involved students in the collaborative construction of knowledge.

Research Question 3: To what extent do the instructional practices of AP Psychology teachers contribute to student learning of the content in the Research Methods and 'Preferred' units of the AP Psychology curriculum?

Background

As presented in the first section of findings, there were striking similarities among AP Psychology teachers' aspects of PCK. Specifically, the teachers in the study described similar elements and experiences that formed their notions of Knowledge of AP Psychology Curricula; Knowledge of Students Understanding of AP Psychology; and Knowledge of AP Assessment Practices. In the second section of findings, I provided evidence of teachers' Knowledge of Instructional Strategies based on observational data from in-class instruction. As one might expect, teachers demonstrated great autonomy with respect to enacting classroom instruction. Thus, there were key differences among teachers as they enacted classroom-based approaches and components for instruction. In this final section of findings, I provide an analysis of student test data to examine the extent to which practices of AP Psychology teachers' contribute to student understanding of content in the Research Methods and "Preferred" units of the AP Psychology curriculum.

Pre- and post-tests of 20 multiple choice questions were administered to students during the Research Methods and teacher "preferred" units of instruction. Tests occurred before students were assigned readings or participated in activities related to the unit and at the end of the unit before the teachers' unit test was administered. Prior to the administration of the pre- or post- tests, teachers were not made aware of the questions or content. All tests contained questions augmented from released AP Exams, textbooks, and commercial study materials to model test questions from the AP Psychology Exam. To design the tests, a master list of test questions was developed; each question was assigned a number, and organized on a spreadsheet. Using the random numbers feature of SPSS, twenty unique value numbers were generated and the individual pre- and post-tests were created to control for test effects. Pre- and post-tests for the Research Methods unit was the same and received by all participating students while the "Preferred" tests were unique to individual teachers' selections[2].

Test data were analyzed quantitatively using descriptive and inferential statistics testing means and variance to help understand student achievement within and between groups. Data collected were based on aggregate student scores (by teacher) from pre- and post-tests of 20 augmented multiple choice questions. Table 9 below lists the aggregated class means, number of test-takers, and standard deviations by school-teacher for the Research Methods and "Preferred" unit pre- and post-tests.

[2] One teacher, Sara, selected Social Psychology as her "Preferred" unit of instruction. John selected Learning and Steve chose Biopsychology as there "Preferred" units while both Jennifer and Michelle chose Development. The tests for Jennifer and Michelle were the same.

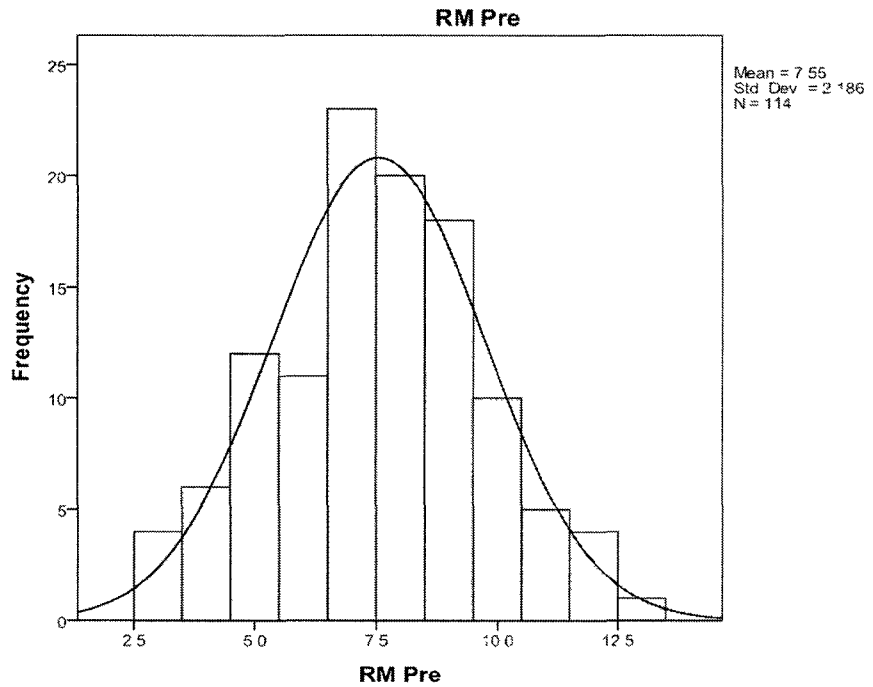
Table 9 – Aggregate Pre- and Post- Test Data from Research Methods and "Preferred" Units for All Teachers.

School - Teacher	Measures	Research Methods Pre-Test	Research Methods Post-Test	Preferred Pre-Test	Preferred Post-Test
School 1:Sara	Mean	7.17	7.96	NA	12.14
	N	29	28	NA	28
	Std Dev.	2.465	2.659	NA	3.194
School 2:John	Mean	7.86	9.33	8.091	11.571
	N	22	22	22	21
	Std Dev.	2.189	3.213	1.875	2.599
School 3:Steve	Mean	6.663	11.37	6.0	10.87
	N	24	24	24	23
	Std Dev.	1.813	2.410	2.126	2.474
School 4:Jennifer	Mean	8.08	11.21	7.9048	13.54
	N	24	24	21	24
	Std Dev.	2.125	2.570	2.16575	2.750
School 5: Michelle	Mean	8.47	12.0	9.5333	14.29
	N	15	15	15	14
	Std Dev.	1.767	3.013	3.02056	2.585
Total	Mean	7.55	10.16	7.6951	12.3761
	N	114	112	82	111
	Std Dev.	2.186	3.106	2.54194	3.174

FINDINGS FOR RESEARCH METHODS UNIT

For the Research Methods pre-test, the mean score for all students was 7.55 (SD, 2.186), with 114 students participating in this test as indicated in Figure 4 below. Scores on the Research Methods pre-test ranged from 3 to 13 out of 20. Students in Steve's class at School 3 scored the lowest of the five schools (*M*=6.663; SD=1.813) while students in Michelle's class at School 5 scored the highest of the five schools (*M*=8.47; SD=1.767). Jennifer's students at School 4 had the second highest scores (*M*=8.08; SD=2.125) followed by John's students at School 2 (*M*=7.86; SD=2.189) and Sara's students at School 1 (*M*=7.17; SD=2.465).

Figure 11 – Histogram: Distribution of Research Method Pre-Test Scores for All Students



An analysis of variance determined statistically significant variation in Research Methods pre-test scores among the five school sites F(4, 113) = 2.552 p.=.043 despite the fact a Tukey HSD post-hoc test did not establish significant differences among student scores by teacher.

Table 10 – ANOVA table for Research Methods Pre-Test

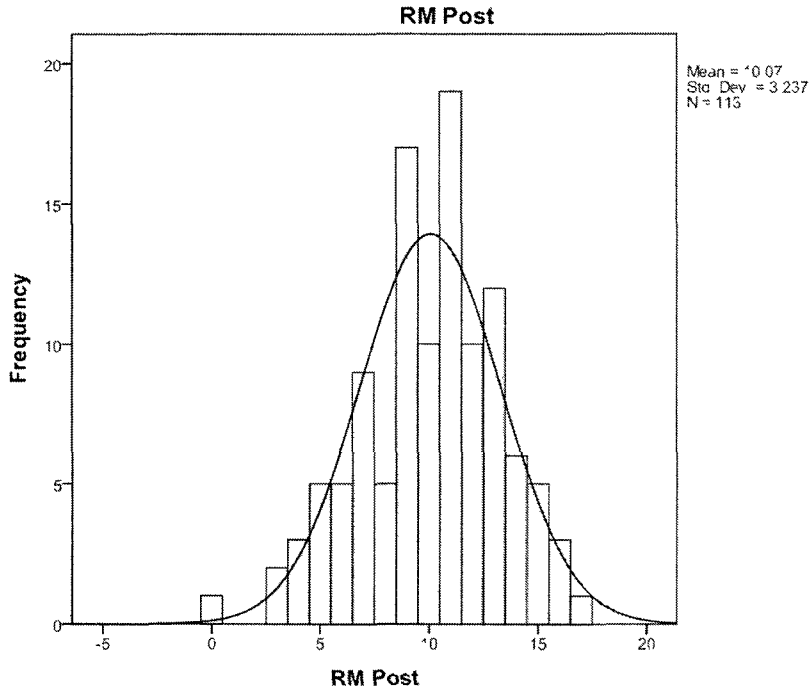
Dependent Variable: Research Methods Pre-Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	46.264[a]	4	11.566	2.552	.043
Intercept	6349.924	1	6349.924	1401.322	.000
School	46.264	4	11.566	2.552	.043
Error	493.921	109	4.531		
Total	7043.000	114			
Corrected Total	540.184	113			

a. R Squared = .086 (Adjusted R Squared = .052)

On the Research Methods post-test, the mean score for all students was 10.16 (SD, 3.106), with 112 students participating in this test; Figure 12 below indicates the distribution of scores. The range of scores on the Research Methods post-test was 3 to 17 out of 20. Students in Michelle's class from School 5 had the highest post-test scores (*M*=12.0; SD=3.013) while Steve's students from School 3 (*M*=11.37; SD=2.410) and Jennifer's students from School 4 (*M*=11.21; SD=2.57) had the next highest scores. The two teachers whose students scored the lowest on the Research Methods post-test were John from School 2 (*M*=9.32; SD=3.213) and Sara from School 1 (*M*=7.96; SD 2.659) respectively.

Figure 12 – Histogram: Distribution of Research Methods Post-Test Scores



An analysis of variance determined statistically significant variation in Research Methods post-test scores among the five school sites $F(4, 112) = 8.565$, $p.<.01$.

Table 11 – ANOVA table for Research Methods Post-Test

Dependent Variable: Research Methods Post-Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	259.787[a]	4	64.947	8.565	.000
Intercept	11401.911	1	11401.911	1503.727	.000
School	259.787	4	64.947	8.565	.000
Error	811.320	107	7.582		
Total	12634.000	112			
Corrected Total	1071.107	111			

a. R Squared = .243 (Adjusted R Squared = .214)

A Tukey HSD post-hoc test established significant differences ($p<.01$) between several pairs of teachers. The bullet point list includes school and teacher name, means and standard deviations, and an indicator of classroom instruction:

- **School 1: Sara** (*M*= 8.22; SD=2.547) (vocabulary/skill development) X **School 3: Steve** (*M*=11.375; SD=2.41) (scaffolding)
- **School 1: Sara** (*M*= 8.22; SD=2.547) (vocabulary/skill development) X **School 4: Jennifer** (*M*=11.2083; SD=2.5704) (multiple instructional strategies)
- **School 1: Sara** (*M*= 8.22; SD=2.547) (vocabulary) X **School 5: Michelle** (*M*= 12.0; SD=3.0128) (multiple instructional strategies)

- **School 2: John** (*M*=9.318; SD=3.213) (lecturer) X **School 3: Steve** (*M*=11.375; SD=2.41) (scaffolding)

- **School 2: John** (*M*=9.318; SD=3.213) (lecturer) X **School 5: Michelle** (*M*= 12.0; SD=3.0128) (multiple instructional strategies)

Due to the fact the analysis of variance for the pre-tests determined a statistically significant variance, a new variable was transformed using a formula to standardize raw difference scores to account for differences in pre-test scores and determine the actual gain for individual students from pre-test to post-test. In other words, I sought to answer the question how do groups, on average, differ in gains? The formula divided the actual gain (post-test total minus pre-test total as the numerator) by the potential gain (total points possible minus pre-test total as the denominator) to determine the standardized gain students for students from pre- to post-test.

Formula: (Post-Test – Pre-Test)

$$\frac{\text{(Post-Test – Pre-Test)}}{\text{(Maximum score – Pre-Test)}}$$

For example, the following student demonstrated a gain of 9 points out of a potential 15 that could have been gained. Thus, the student gained .60 (or 60%) of the possible points that could have been gained from pre- to post-test.

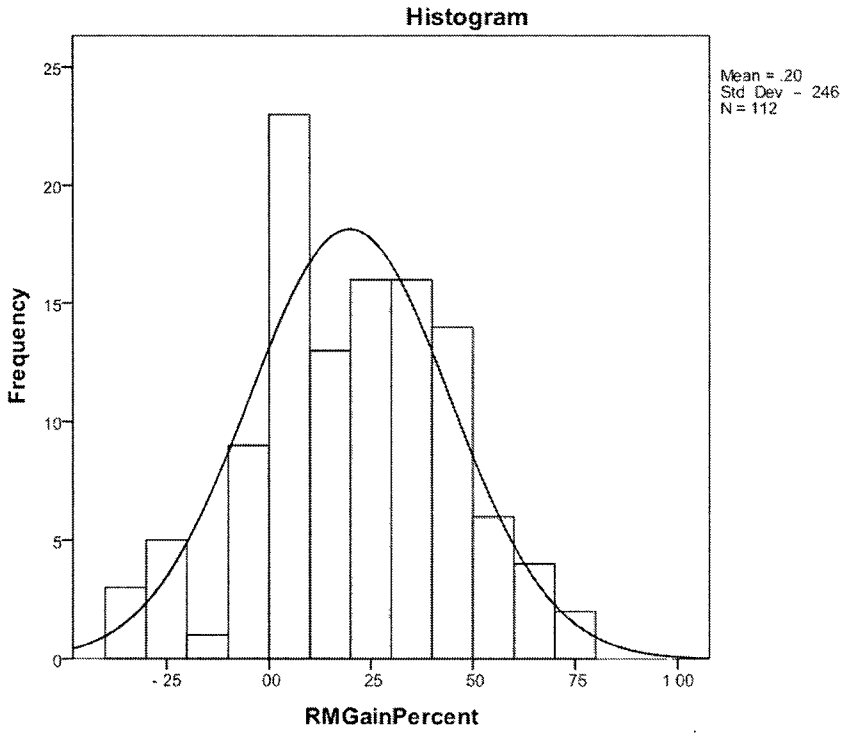
Example: $\frac{14 - 5}{20 - 5} = \frac{9}{15} = 0.60$

Table 12 – Standardized Gain Scores for Research Methods

School	Mean	N	Std. Deviation	Minimum	Maximum
1 - Sara	.0464	28	.18034	-.36	.31
2 – John	.1116	22	.24453	-.37	.46
3 – Steve	.3480	24	.18993	0.0	.71
4 – Jennifer	.2436	24	.24862	-.25	.60
5 - Michelle	.3033	14	.24602	0.0	.77
Total	.1982	112	.24614	-.37	.77

For the new measure of student gains from pre-test to post-test of the Research Methods unit, the standardized mean gain score for all students was .1982 (SD, .24614), with 112 students accounted for in this new measure as indicated in Table 11 above. In other words, on average, students gained .1982 (or 19.8%) of the possible points that could have been gained from pre- to post-test. The range of scores for this standardized gain scores was -.37 to .77; again, the range covers students earned 37% less or gained 77% of the possible points that could have been gained from pre-test to post-test. Students in Steve's class from School 3 posted the highest (34.8%) standardized gain scores (*M*=.3480; SD=.18993) while Michelle's students from School 5 (*M*=.3033; SD=.24602) and Jennifer's students from School 4 (*M*=.2436; SD=.24862) had the next highest standardized gain scores. The two teachers whose students showed the lowest gains for the Research Methods unit were John from School 2 (*M*=.1116; SD=.24453) and Sara from School 1 (*M*=.0464; SD=.18034) respectively.

Figure 13 – Histogram: Distribution of Research Methods Standardized Gain Scores



An analysis of variance determined statistically significant variation in standardized gain scores for the Research Methods tests among the five school sites $F(4, 112) = 8.031$, $p.<.01$.

Table 13 – ANOVA table for Research Methods Standardized Gain Scores

Dependent Variable: Research Methods Standardized Gain Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.553[a]	4	.388	8.031	.000
Intercept	4.699	1	4.699	97.206	.000
School	1.553	4	.388	8.031	.000
Error	5.172	107	.048		
Total	11.124	112			
Corrected Total	6.725	111			

a. R Squared = .231 (Adjusted R Squared = .202)

A Tukey HSD post-hoc test established significant differences ($p<.05$) between several pairs of teachers. The bullet point list includes school and teacher name, means and standard deviations, and an indicator of classroom instruction:

- **School 1: Sara** (*M*= .0464; SD=.18034) (vocabulary/skill development) X **School 3: Steve** (*M*=.3480; SD=.18993) (scaffolding)
- **School 1: Sara** (*M*=0464; SD=.18034) (vocabulary/skill development) X **School 4: Jennifer** (*M*=.2436; SD=.24862) (multiple instructional strategies)

- **School 1: Sara** (*M*= 0464; SD=.18034) (vocabulary) X **School 5: Michelle** (*M*= .3033; SD=.24602) (multiple instructional strategies)

- **School 2: John** (*M*=.1116; SD=.24453) (lecturer) X **School 3: Steve** (*M*=.3480; SD=.18993) (scaffolding)

These data demonstrate the significant differences among pairs of teachers with respect to the percentage of questions students in the respective classes gained from pre-test to post-test in the Research Methods unit. Overall, Sara's students showed a lesser percentage gain in scores (4.64%) from pre-test to post-test than all of the other students in other schools. Three of the differences were significant at $p<.02$. For example, Sara's students gained 30.16% of the possible points that could have been gained from pre- to post-test less than Steve's students, 19.72% less than Jennifer's students and 25.69% less than Michelle's students. In addition, students in John's class gained 23.64% of the possible points less than Steve's students. The finding suggests that for the Research Methods unit, students in classes where teachers employed scaffolding techniques and multiple instructional strategies showed a greater percentage improvement of possible points that could have been gained from pre- to post-test in the Research Methods unit.

Overall, there was a statistically significant difference between mean pre- and post-test scores for all students who participated in the Research Methods unit testing. Below, in Table 13, the overall mean for 112 students on the Research Methods pre-test was 7.55 (SD=2.197) and the post-test 10.16 (SD=3.106).

Table 14 – Descriptive Statistics for Research Methods Post- and Pre-Tests

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	RM Post	10.16	112	3.106	.294
	RM Pre	7.55	112	2.197	.208

A paired sample t-test was conducted to compare the difference in pre- and post-test scores for the Research Methods unit with the overall mean test scores t (111) = 8.794, p.<.01. As should be expected, the results indicate students in all classes performed better on the post-test than the pre-test for the Research Methods unit.

Table 15 – Results of a Paired Sample T-Test for Research Methods

Research Methods	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
Pair 1 RM Post - RM Pre	2.607	3.138	.296	8.794	111	.001

FINDINGS FOR TEACHERS' PREFERRED UNIT

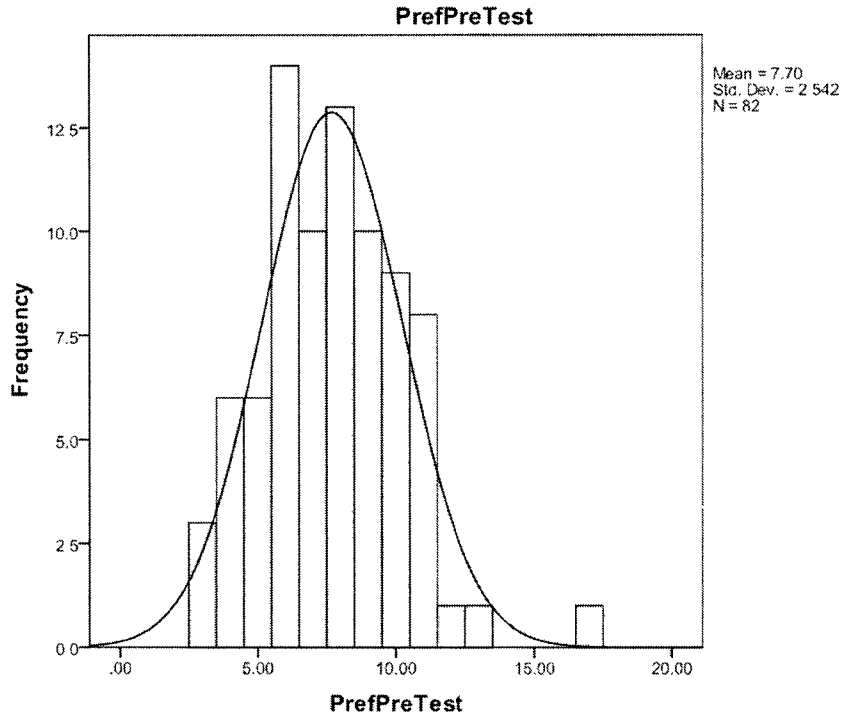
Teachers were allowed to choose a "Preferred" unit of instruction from the AP Psychology curriculum and their students participated in a similar format of tests as during the Research Methods unit. Students were administered the pre-test prior to any formal instruction

and the post-test prior to the teachers' unit exam. As identified earlier, Sara chose Social Psychology, John chose Learning, Steve chose Biopsychology, and Jennifer and Michelle chose Development for their "Preferred" units of instruction. Due to the different content in the unique units of instruction, making comparisons across teachers like was done with the Research Methods unit is more complex. However, the analysis of descriptive and inferential statistics does illuminate some interesting findings.

The mean score for all students on their respective "Preferred" pre-test was 7.6951 (SD, 2.54194), with 82 students participating in this test as indicated in Figure 14 below[3]. Scores on the "Preferred" unit pre-test ranged from 3 to 17 out of 20. Students in Steve's class at School 3 scored the lowest of the five schools (M=6.0; SD=2.12644) while students in Michelle's class at School 5 scored the highest of the five schools (M=9.5333; SD=3.02056). John's students at School 2 had the second highest scores (M=8.0909; SD=1.87487) followed by Jennifer's students at School 4 (M=7.9048; SD=2.1657).

[3] It is important to note that students in Sara's class were not administered a pre-test for the "Preferred" unit. The reason for this discrepancy in the data sources is due to an initial agreement by committee members to not include a pre-test for the "Preferred" unit when the study first began in the spring of 2010. However, after consultation and further discussion with the committee, we agreed to begin administering pre-tests with the next round of teachers starting in the fall of 2010 for the final phase of the dissertation.

Figure 14 – Histogram: Distribution of "Preferred" Unit Pre-Test Scores



An analysis of variance determined statistically significant variation in "Preferred" unit pre-test scores among the four school sites $F(3, 82) = 8.074$, $p.<.01$.

Table 16 – ANOVA table for "Preferred" Unit Pre-Test

Dependent Variable: "Preferred" Pre-Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	124.017[a]	3	41.339	8.074	.000
Intercept	4935.670	1	4935.670	963.996	.000
School	124.017	3	41.339	8.074	.000
Error	399.361	78	5.120		
Total	5379.000	82			
Corrected Total	523.378	81			

a. R Squared = .237 (Adjusted R Squared = .208)

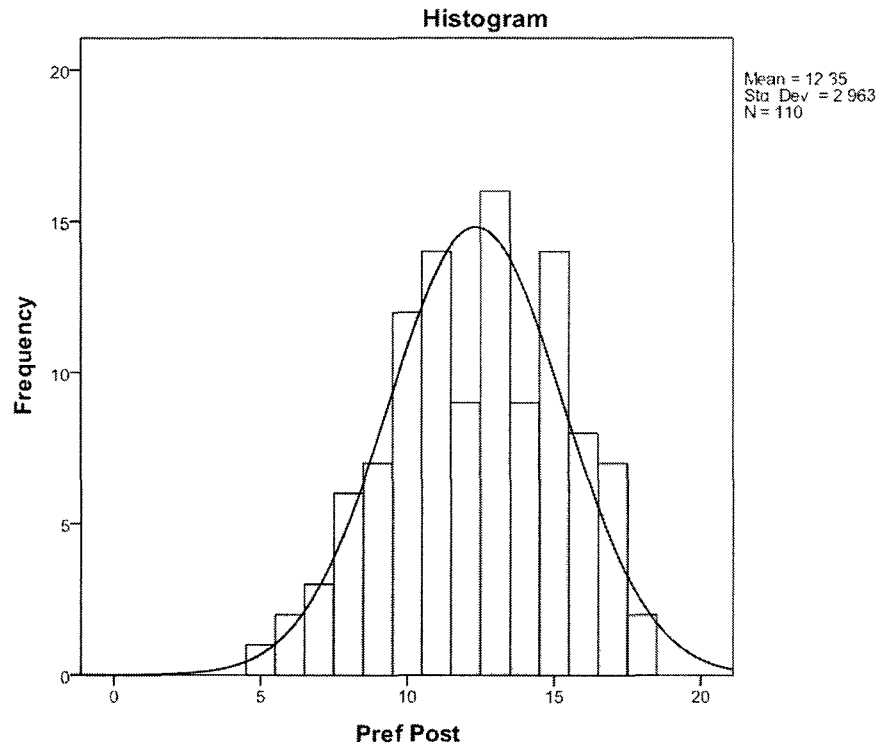
Specifically, a Tukey HSD post-hoc test established significant differences ($p<.05$) between several pairs of teachers. The bullet point list includes school and teacher name, means and standard deviations, and name of "Preferred" unit:

- **School 3: Steve** (*M*=6.0; SD=2.12644) (Biopsychology) X **School 2: John** (*M*=8.0909; SD=1.87487) (Learning)
- **School 3: Steve** (*M*=6.0; SD=2.12644) (Biopsychology) X **School 4: Jennifer** (*M*=7.9048; SD=2.1657) (Development)
- **School 3: Steve** (*M*=6.0; SD=2.12644) (Biopsychology) X **School 5: Michelle** (*M*=9.5333; SD=3.02056). (Development)

The mean score for all students on their respective "Preferred" pre-test was 12.35 (SD, 2.963), with 110 students participating in this test as indicated in Figure 15 below[4]. Scores on the "Preferred" unit pre-test ranged from 5 to 18 out of 20. Students in Steve's class at School 3 scored the lowest of the five schools for the Biopsychology unit (M=10.87; SD=2.474) while students in Michelle's class at School 5 scored the highest of the five schools for the Development unit (M=14.29; SD=2.585). Jennifer's students at School 4 had the second highest scores for the Development unit (M=13.54; SD=2.750) followed by Sara's students at School 1 for the Social Psychology unit (M=12.14; SD=3.194) and John's students at School 2 for the Learning unit (M=11.57; SD=2.599).

[4] It is important to note that students in Sara's class were not administered a pre-test for the "Preferred" unit. The reason for this discrepancy in the data sources is due to an initial agreement by committee members to not include a pre-test for the "Preferred" unit when the study first began in the spring of 2010. However, after consultation and further discussion with the committee, we agreed to begin administering pre-tests with the next round of teachers starting in the fall of 2010 for the final phase of the dissertation.

Figure 15 – Histogram: Distribution of "Preferred" Unit Post-Test Scores



An analysis of variance determined statistically significant variation in "Preferred" unit post-test scores among the five school sites F(4, 110) = 4.914, p.<.01.

Table 17– ANOVA table for "Preferred" Unit Post-Test

Dependent Variable: "Preferred" Post-Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	150.877[a]	4	37.719	4.914	.001
Intercept	16236.144	1	16236.144	2115.142	.000
School	150.877	4	37.719	4.914	.001
Error	805.996	105	7.676		
Total	17722.000	110			
Corrected Total	956.873	109			

a. R Squared = .158 (Adjusted R Squared = .126)

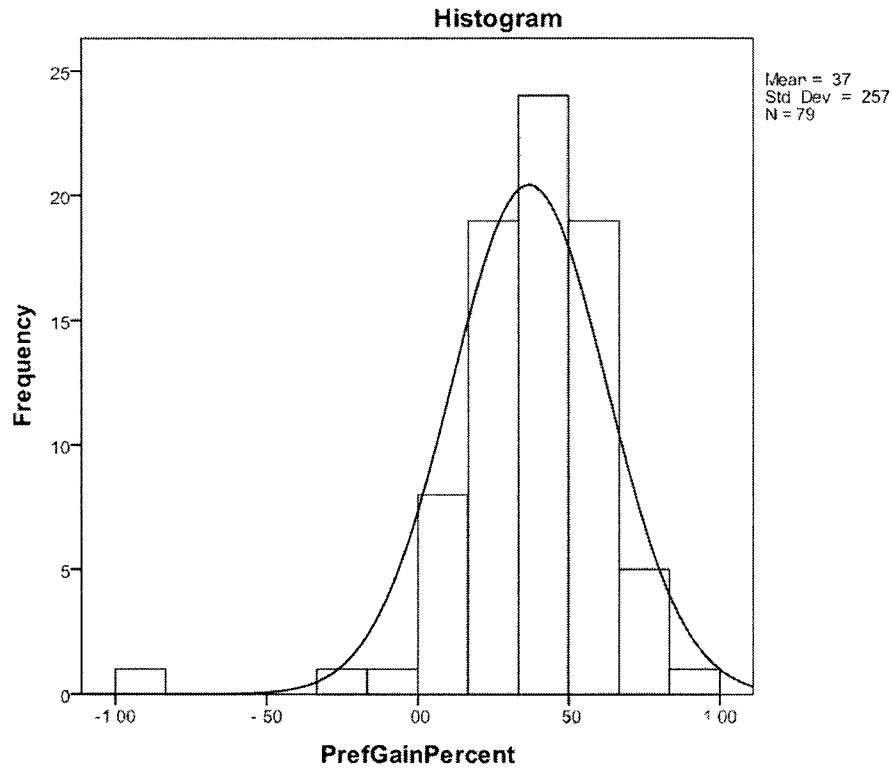
A Tukey HSD Post-hoc test for the "Preferred" Unit Post-Test indicated which pairs were significant (p<.01)

- **School 2: John** (*M*=11.571; SD=2.599) (Learning) X **School 5: Michelle** (*M*=14.29; SD=2.585) (Development) – Difference 2.71
- **School 3: Steve** (*M*=10.87; SD=2.474) (Biopsychology) X **School 4: Jennifer** (*M*=13.54; SD=2.750) (Development) – Difference 2.67
- **School 3: Steve** (*M*=10.87; SD=2.474) (Biopsychology) X **School 5: Michelle** (*M*=14.29; SD=2.585) (Development) – Difference 3.42

The mean standardized gain score for all students on their respective "Preferred" unit was .3682 (SD=.25718), with 86 students participating in this test as indicated in Figure 16 below[5]. Standardized gain scores on the "Preferred" unit pre-test ranged from -1 to +.86. Students in John's class at School 2 scored the lowest standardized gain of the four schools for the Learning unit (*M*=.2833; SD=.2000) while students in Jennifer's class at School 4 showed the highest standardized gain of the four schools for the Development unit (*M*=.4799; SD=.1766). Michelle's students at School 5 had the second highest standardized gain scores for the Development unit (*M*=.3818; SD=.44548) followed by Steve's students at School 3 for the Biopsychology unit (*M*=.3355; SD=.18024).

[5] It is important to note that students in Sara's class were not administered a pre-test for the "Preferred" unit. The reason for this discrepancy in the data sources is due to an initial agreement by committee members to not include a pre-test for the "Preferred" unit when the study first began in the spring of 2010. However, after consultation and further discussion with the committee, we agreed to begin administering pre-tests with the next round of teachers starting in the fall of 2010 for the final phase of the dissertation.

Figure 16 – Histogram: Distribution of "Preferred" Unit Standardized Gain Scores



An analysis of variance did not determine statistically significant variation in standardized gain scores for the "Preferred" unit among the four school sites F(3, 79) = 2.333, p.>.05.

Table 18– ANOVA table for "Preferred" Unit Standardized Gain Scores

Dependent Variable: Preferred Unit Standardized Gain Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.440[a]	3	.147	2.333	.081
Intercept	10.431	1	10.431	165.783	.000
School	.440	3	.147	2.333	.081
Error	4.719	75	.063		
Total	15.870	79			
Corrected Total	5.159	78			

a. R Squared = .085 (Adjusted R Squared = .049)

Overall, there was a statistically significant difference between mean pre- and post-test scores for all students who participated in the "Preferred" unit testing. Below, in Table 18, the overall mean for 79 students on the "Preferred" pre-test was 7.7215 (SD=2.49068) and the post-test 12.41 (SD=2.862).

Table 19 – Descriptive Statistics for "Preferred" Post- and Pre-Tests

		Mean	N	Std. Deviation	Std. Error Mean
Pair 2	Pref Post	12.41	79	2.862	.322
	PrefPreTest	7.7215	79	2.49068	.28022

A paired sample t-test was conducted to compare the difference in pre- and post-test scores for the "Preferred" unit with the overall mean test scores t (78) = 14.364, p.<.01. Again, as should be expected, the results indicate students in all classes performed better on the post-test than the pre-test for each teachers' "Preferred" unit.

Table 20 – Results of a Paired Sample T-Test for "Preferred" Unit

"Preferred" Unit	Paired Differences					
	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pair 2 Pref Post - PrefPreTest	4.68354	2.89803	.32605	14.364	78	.000

Overall, there was a statistically significant difference between mean post-test scores for all students who participated in the Research Methods and "Preferred" unit tests. Below, in Table 20, the overall mean for 108 students on the Research Methods post-test was 10.19 (SD=3.085) and the "Preferred" post-test was 12.38 (SD=2.915).

Table 21– Descriptive Statistics for Research Methods and "Preferred" Post- Tests

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pref Post	12.38	108	2.915	.281
	RM Post	10.19	108	3.085	.297

A paired sample t-test was conducted to compare the difference in post-test scores for the Research Methods and "Preferred" units with the overall mean test scores t (107) = 6.996, p.<.01. The results indicate students in all classes performed better on the post-test for the "Preferred" unit than the Research Methods unit.

Table 22 – Results of a Paired Sample T-Test for the Research Methods and "Preferred" Units Post-Test Scores

Comparison of "Preferred" vs. Research Methods		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	Pref Post - RM Post	2.194	3.260	.314	6.996	107	.000

Overall, there was not a statistically significant difference between mean standardized gain scores for the Research Methods and "Preferred" units. Below, in Table 22, the students'

(n=78) standardized gain score for the "Preferred" unit (M=.3672; SD=.2587) was higher than the same measure for the Research Methods unit (*M*=.2481; SD=.23924).

Table 23 – Descriptive Statistics for Research Methods and "Preferred" Standardized Gain Scores

Units		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PrefGainPercent	.3672	78	.25870	.02929
	RMGainPercent	.2481	78	.23924	.02709

Table 24 – Results of a Paired Sample T-Test for the Research Methods and "Preferred" Standard Gain Scores

Paired Samples Test

Units		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	PrefGainPercent - RMGainPercent	.11910	.34152	.03867	3.080	77	.003

Summary of Findings

Research Methods

These data for the Research Methods unit demonstrate there were statistically significant variations in pre- and post-test scores among students in teachers' classes. Of particular interest are the pairs of teachers whose overall mean post-test scores were

statistically significant as confirmed by the ANOVA and subsequent Tukey HSD post-hoc test. These statistically significant differences demonstrate that on primary outcomes, as measured by overall post-test scores, might be attributed to individual teachers' enactment of approaches and components during classroom instruction. For Sara and John, skill development and expository teaching as the sole means of instruction did not serve their students well when measured by post-test scores compared to Steve, Jennifer, and Michelle who clearly employed scaffolding techniques and multiple approaches and components for instruction.

Due to the fact the overall ANOVA for the Research Methods pre-test was statistically significant, a secondary outcome measure, a standardized gain score, was derived in order to represent the change in scores from pre-test to post-test. The standardized gain score attempted to answer the question: how do groups, on average, differ in gains? Overall, the adjustment to standardized gain scores from the primary outcome measure, mean post-test scores for the Research Methods unit, highlighted similar differences in among teachers with the exception of one. The finding for the secondary outcome measure suggests that for the Research Methods unit, students in classes where teachers employed scaffolding techniques and multiple approaches and components for instruction showed a greater percentage improvement of gains from pre- to post-test.

It should be noted that the aggregate mean scores demonstrated growth from pre-test to post-test for all students, regardless of teacher instruction, in the Research Method unit based on a paired sample t-test; $t(111) = 8.794$, $p.<.01$. However, the evidence from an analysis of inferential statistics highlights statistically significant differences in the overall student test scores as a primary outcome measure and standardized gains as a secondary outcome measure occurred for students in classes where teachers employed multiple approaches and components during classroom-based instruction.

"Preferred" Unit

Jennifer and Michelle who both selected Development as their "Preferred" unit while the other teachers selected different "Preferred" units for comparison including: Steve – Biopsychology; John – Learning; and, Sara – Social Psychology. Thus, cross-case comparison is more difficult than the Research Methods unit wherein all students were administered the same pre- and post-tests. However, the analysis of descriptive and inferential statistics illuminated several findings. For example, an ANOVA and subsequent Tukey HSD established statistically significant variation in pre-test scores for Steve's Biopsychology unit compared to all other teachers. This finding highlights the absence of prior biology knowledge among students in Steve's class compared to others.

An examination of post-test scores with an ANOVA and Tukey HSD post-hoc tests indicated a statistically significant difference in scores for the group of teachers as a whole and specifically between John and Michelle, Steve and Jennifer, and Steve and Michelle. This finding can be parsed in two ways. One, the statistically significant difference between post-test scores for John and Michelle highlight the differences in instruction between the two teachers. John's primary approach was expository teaching with components including teacher-created analogies and elaboration compared to Michelle who employed multiple approaches and components during instruction. Two, the statistically significant difference in scores for students in Steve's vs. Jennifer and Michelle's class can be linked to previous research on teaching high school psychology. Specifically, the connection to previous research that called attention to the high levels of course work (Knowledge of Content Area) in humanistic areas of psychology (Ryan, 1974) and the challenge of teaching scientific-oriented subject-matter (Breland, 1978; Engle, 1967; Ragland, 1992).

Similar to the Research Methods test data, a standardized gain score was created as a secondary outcome measure for the teachers' "Preferred" units. An analysis of variance did not determine statistically significant variation in standardized gain scores for the "Preferred" unit among the schools sites where pre- and post-tests were administered. However, the descriptive statistics showed a difference in pre-test and post-test scores for the "Preferred" units with means of 7.7215 (SD=2.49068) and 12.41 (SD=2.862) respectively. Results from a paired sample t-test concluded the difference in pre- and post-test scores for the "Preferred" unit was statistically significant; $t(78) = 14.364$, $p.<.01$.

Comparison Across Units

Statistical comparisons were made on the primary outcome measure (post-test scores) and secondary outcome measure (standardized gain score) for the Research Methods and "Preferred" units. For the primary outcome measure, a paired sample t-test was conducted to compare the difference in post-test scores for the Research Methods (M=10.19; SD=3.085) and "Preferred" (M=12.38; SD=2.915) units with the overall mean post- test scores $t(107) = 6.996$, $p.<.01$. The results indicate students in all classes performed better on the post-test for the "Preferred" unit than the Research Methods unit. For the secondary outcome measure, a paired-sample t-test also did not result in a statistically significant difference between mean standardized gain scores despite noticeable difference in the descriptive data; students showed a 36.7% growth from pre-to post-test in the "Preferred" unit compared to 24.8% growth in the Research Methods unit. These findings elucidate the descriptions of teachers' in-class instruction highlighted in the previous section. Moreover, the differences between the Research Methods and "Preferred" units demonstrate the better scores in the "Preferred" unit and substantial gains from pre- to post-test may be linked to shifts in the employment of additional approaches and components when teaching the "Preferred" units. In sum, students achieved

higher scores on post-tests in classes where teachers demonstrated reflective and repeated planning, a greater repertoire of content-specific activities, varied instruction to represent content in multiple forms, and utilized formative assessments to check student understanding.

Chapter Six: Discussion

Pedagogical content knowledge is a way of representing the complex interaction between teachers' understandings of content and pedagogy and the influence on classroom instruction. To this end, this study sought to identify components of teachers' PCK, the influence of PCK on the instructional practices of AP Psychology teachers, and the extent to which the practices were effective.

In this chapter, I review the major findings that emerged from this research organized around the three research questions guiding the study. I then discuss the limitations of this research noting what I have not explored or was not able to address. I then turn to the implications of this research and consider how the findings of this study inform teacher practices in AP Psychology. I close with a discussion of contributions this work makes to the field of research in teacher education and, finally, consider some of the possibilities this research suggests for further inquiry.

Research Question 1: What are the critical attributes of AP Psychology teachers' pedagogical content knowledge?

AP Psychology teachers' pedagogical content knowledge consists of the interaction of five components: (1) orientations toward teaching AP Psychology, (2) knowledge about the AP Psychology curriculum, (3) knowledge about students' understanding of AP Psychology, (4) knowledge about assessment in AP Psychology, (5) knowledge of instructional strategies for teaching AP Psychology.

Orientations to Teaching AP Psychology –

Orientations to Teaching AP Psychology was a crucial component of PCK as it identified the academic and professional training and experiences that influenced the development of teachers' knowledge and beliefs for teaching AP Psychology. The profound influence of professional development and classroom experience on AP Psychology teachers' development

of requisite content knowledge and how to incorporate instructional activities and demonstrations in their pedagogical repertoires cannot be understated. Formal academic training was not identified as the main source of content knowledge development for teaching AP Psychology and teachers commented that their undergraduate training prepared them to teach a "general" psychology courses at the high school level, but not well enough to teach AP Psychology. Historically, high school psychology teachers had limited training so it comes as no surprise that AP Psychology teachers would also require additional training (Engle, 1952, 1967; Abrams and Stanley, 1967; Ryan, 1974; Anderson, 1965; McFadden and Pasewark, 1970; Noland, 1967; Epley and Schwerin, 1977; Wertheimer, 1973; Ragland, 1992).

In addition, the teachers in this study had years of classroom experience and had earned advanced degrees. Grossman (1990) suggests, "Teachers acquire pedagogical content knowledge from actual classroom experience" (p. 15). Through classroom experiences, teachers continued to develop new knowledge in specific content areas and modify lesson plans to include new instructional strategies to promote student learning through an iterative process to better understand the AP Psychology curriculum and successful test preparation practices.

Knowledge of the AP Psychology Curriculum

Knowledge of the AP Psychology Curriculum played a pivotal role in teachers' PCK; decision-making was strongly influenced by the AP Psychology curriculum and the percentage of questions on the Exam. Thus, teachers' goals and objectives were aligned with content coverage and student test preparation. The alignment with and connection to the AP Psychology Curriculum influenced what teachers selected to cover during in-class instruction and affected teachers' instructional choices for how content was presented to students.

Teachers constantly negotiated the breadth and depth of content coverage in their written schedule, often at the expense of differentiated instruction. To some degree, the teachers experienced cognitive dissonance between understanding their planning was designed to facilitate student learning through use of various instructional strategies and their individual decision-rules to keep a strict schedule to cover content which required teachers to eliminate the enactment of potentially rich instructional strategies. When asked to describe or identify strategies that promoted student learning, teachers were able to provide detailed descriptions of approaches and components from lessons in a variety of different units of instruction. However, the caveat "if we have time" was part of the description offered by teachers and in many cases, teachers shared elaborate examples of active learning that were planned for after the Exam in May.

These findings align with previous research of teacher practices in AP courses wherein teachers reported challenges of covering the content in the allotted amount of time and concerns that the teaching and learning strategies employed in the classroom were not aligned with current visions of how students learn (Paek et. al, 2005; Paek et. al, 2007). AP teachers tend to make use of strategies that can cover the content in the most efficient way – through lecture (Paek et. al, 2005; Paek et. al, 2007). . For the teachers in this study, expository teaching and direct instruction were the default approaches to in-class instruction in order to implement the planned schedule. The magnitude of reliance on these approaches differed across school sites – John, Sara, and Steve relied more heavily on these approaches than Jennifer and Michelle. Many of the rich activities for instruction were obtained through materials made available through the plentiful resources offered by the College Board, course textbook, supplemental sources, and other technology-based resources were the first cut from instruction.

It was clear that the amount of content in the curriculum and demands posed by the exam limited teachers from employing approaches and components as they would have liked.

Knowledge of Students' Understanding of AP Psychology

Recent iterations of PCK have focused greater attention on the facets of teachers' ability to anticipate students understanding or misunderstanding within the subject matter (Grossman et. al, 2005; Hashweh, 2005). Students in this study of AP Psychology classes were a homogeneous group in terms of race, upper level math and high school psychology experience, and overall experience with AP courses and Exams. Students in the AP Psychology course were not only novices in terms of prior or prerequisite knowledge of specific or topical psychology content, but also with respect to demands of an Advanced Placement course and AP Exam. Various factors influenced the development of teachers' *Knowledge of Students' Understanding of AP Psychology* as a component of PCK in order to meet students' needs. In the case of AP Psychology, and I suspect for other AP courses too, sophisticated understanding of students enables teachers to better gauge student understanding/misunderstanding and assists teachers in selecting content that is appropriate for students.

Requirements for student entry to AP Psychology varied slightly across school contexts. A large majority of students were juniors who entered AP Psychology without prior knowledge from a high school psychology course or AP course or Exam experience. Across school sites, open enrollment initiatives were enacted to increase student participation in AP courses. For AP Psychology specifically, the students were novices in terms of knowledge of psychology content and experience with AP. Taken together, teachers attempted to make the content covered during in-class instruction relevant to students through the employment of analogies and elaboration in addition to assessment practices that focused on test preparation.

According to teachers, increased enrollment in AP Psychology was attributed to several factors. The primary factor teachers believed was that students' enrolled due to motivation by the possibility of earning college credit from a score of 3 or higher on the Exam. Of additional interest, the teachers put forward the notion that "AP is a safe course to try AP" which resulted in a wider range of student abilities than other AP courses at their respective schools. The students in the AP Psychology course were therefore viewed as novices, motivated by college credit, with wide ranging ability levels. This recognition of students played a critical role in the development of teachers' PCK and influenced the structuring and implementation of the curriculum to meet the needs of their students. Teachers were faced with the challenging task of transforming the students' content knowledge from novice to expert in addition to preparing large numbers of students to become successful test-takers.

During in-class instruction, teachers interacted with students to ascertain misunderstanding through student-generated questions and reading students' non-verbal cues. When students indicated misunderstanding, teachers tried to re-teach or explain concepts by providing examples/non-examples, analogies, and elaboration; a critical attribute of PCK. Teachers consistently demonstrated strong content knowledge and the ability to anticipate misunderstanding by having different examples or new ways of explaining concepts readily available. According to Grossman et. al (2005), PCK is mostly influenced by a teachers' understanding of the subject matter and the teachers knowledge of students along with their ability to deal with students' misunderstanding.

For teachers, understanding areas of student difficulty was an imperative component of their *Knowledge of Students' Understanding of AP Psychology.* For example, students often struggled to differentiate between abstract concepts or vocabulary terms that had similar meaning. Repeated experiences teaching familiar topics enabled teachers to anticipate student

confusion and make the appropriate modifications to instruction from repertoires developed for representing content and transforming topic-specific subject matter (Hasweh, 2005). Deep conceptual understanding of difficult topics in addition to easily accessible repertoires for instruction demonstrate a necessary level of sophistication and expertise teachers with strong PCK need to possess for classroom instruction.

Knowledge of Assessment in AP Psychology

AP Psychology teachers *Knowledge of Assessment in AP Psychology* as a component of PCK was closely aligned with teachers' *Knowledge of the AP Psychology Curriculum* and consequently the Exam practices of AP Psychology. Through the AP Course Audit, teachers developed plans that aligned with the AP Psychology curricular framework. This process influenced teachers' selection and exclusion of content and therefore the dimensions of AP Psychology learning to include in assessments. Content coverage was largely based on what teachers anticipated might appear on the AP Psychology Exam and focused in-class instruction accordingly.

Teachers' assessment practices were modeled after the multiple choice and FRE portions of the AP Exam. Previous research illustrated teachers assess students by focusing on the multiple choice and free response portions of the AP Exam (Paek et. al, 2005). In this study, teachers' main forms of assessments allowed students to practice responding to questions of the same format.

Research Question Two: In what ways does pedagogical content knowledge influence AP Psychology teachers' instruction of the Research Methods and 'Preferred' units of the AP Psychology curriculum?

As a component of PCK, teachers' *Knowledge of Instructional Strategies for Teaching AP Psychology* was investigated through classroom observations, analysis of field notes, and

interviews. This component refers to instances of how knowledge is transformed and represented during instruction to promote student understanding by focusing on teachers' content representations, professional and pedagogical repertoires, and knowledge transformation in teaching difficult topic-specific subject-matter (Grossman et. al, 2005; Hashweh, 2005). As such, the focus of question number two seeks to identify the content representations, repertoires and knowledge transformation of AP Psychology teachers to understand teachers' pedagogical content knowledge at a micro-level within topic-specific units of instruction.

Between the Research Methods and 'Preferred' units, teachers' employed approaches consistently and components uniquely; there was greater representation of complex content to learners in 'Preferred' units as teachers made the content relevant to students. As the most prominent example, John employed expository teaching and direct instruction as the main approaches for both units. His power point presentations were filled with text-based and visual representations of concepts and during instruction John used analogies and elaboration to teach the content for both units. During his 'Preferred' Unit: Learning, John added demonstrations for operant and classical conditioning, several videos from popular televisions shows to illustrate learning concepts in context, and various advance organizers with visual representations of challenging concepts. In other words, he taught his 'Preferred' unit by incorporating a greater repertoire of instructional strategies by representing concepts through multiple means.

Sara focused in-class instruction through expository teaching and direct instruction approaches to teach the Research Methods unit. Advance organizers were used for vocabulary and note-taking skill development prior to student participation in demonstrations, collaborative work, and practice. In her 'Preferred' Unit: Social Psychology, Sara shifted to both project and

discovery-based learning as the main approaches for in-class instruction. Content representation and knowledge transformation was in the hands and minds of students in the Social Psychology unit.

Steve labeled himself as a "storytelling lecturer" but clearly illustrated an erudite understanding of scaffolding and the development of student learning through the employment of multiple approaches and components for instruction in the Research Methods unit. Expository teaching and direct instruction approaches were employed in brief and followed up with hands-on learning and instructional simulation. Steve required students to complete authentic tasks, demonstrations, and collaborative work during in-class instruction. For his 'Preferred' unit: Biopsychology, Steve followed a similar pattern in the employment of approaches and components for instruction; although more direct instruction was used in the unit to teach the biological concepts.

Jennifer and Michelle were very similar in their approaches and components for instruction. Both focused in-class instruction through discovery-based, hands-on learning, simulation, and role play approaches for the Research Methods and 'Preferred' units. Michelle added instructional game and project-based learning approaches to the Development unit. Students were actively involved in learning through participation in collaborative and cooperative work as content was presented and represented in multiple forms. More than the other teachers in the study, the repertoire of instructional strategies of Jennifer and Michelle reflected a discursive process of understanding and reasoning toward the aim of providing students with myriad opportunities to demonstrate understanding during in-class instruction.

Research Question Three: To what extent do the instructional practices of AP Psychology teachers contribute to student learning of the content in the Research Methods and 'Preferred' units of the AP Psychology curriculum?

Overall, students achieved higher scores on post-tests in classes where teachers: demonstrated a greater repertoire of approaches and components for instruction; represented content in multiple forms for students; and engaged students in content-specific activities during in-class instruction. There was a statistically significant difference in student scores on the Research Methods post-test which favored classrooms where teachers employed multiple approaches and components for instruction compared to classrooms where teachers focused instruction through expository teaching and direct instruction. A statistically significant difference in student post-test scores for the teachers' 'Preferred' unit also which favored classrooms where teachers employed multiple approaches and components for instruction compared to classrooms where teachers focused instruction through expository teaching and direct instruction. Finally, comparisons were made on post-test scores between units of instruction and indicated students in all classes performed better on the post-test for the "Preferred" unit than the Research Methods unit. Taken together, these findings highlight the importance and value of the instructional practices of AP Psychology teachers. Varied approaches and components for instruction, as part of teachers' pedagogical repertoires effectively facilitates student understanding. Teachers' ability to represent content and transform knowledge for students during instruction is an integral and perhaps the most important component of PCK for AP Psychology teachers.

Naturally, the types of the questions on the pre- and post test were scrutinized for fidelity. Based on a thorough analysis of data from observational notes taken during in-class instruction, documents and handouts students' received, and teachers' commentary during interviews, the test questions developed and included on the pre- and post-test for the Research Methods and 'Preferred' units were taught to the students in some manner. In other words, the

test questions were representative of the content students covered during the units of instruction. Among the teachers and researcher, the tests were considered valid measures of student learning; replicated with similar wording, number of choices, and challenge to the AP Psychology Exam. All teachers were provided an opportunity to review and respond to the questions of the pre- and post-tests during the third and final interview after the students' test scores were analyzed statistically. In addition to providing teachers the opportunity to evaluate the test measures for fidelity, I sought alternative explanations for the findings beyond the differences in teachers' pedagogical practices in the classroom.

As mentioned, all of the teachers taught the content asked in the test questions through some form of instruction during the unit. In the Research Methods unit, for example, John relied on independent practice in the form of the textbook reading to teach standard deviation compared to Jennifer and Steve who taught standard deviation through authentic tasks of data collection, derivation through application, and visual representations of data. Findings from analysis of the test data seemed to indicate the value and importance of pedagogical choices for instruction with respect to higher outcomes on student measures of learning. Thus, the question was asked, "What else accounts for the difference in scores?"

Research Methods, for all but Jennifer (her second unit), was the first unit of instruction as students started their journey through AP Psychology. Consequently, teachers indicated having to re-teach Research Methods-related content throughout the entire AP Psychology course. For example, all of the teachers included vocabulary and concepts (i.e. independent variable, dependent variable, operational definition) from the Research Methods unit in their 'Preferred' unit of instruction. Sara made an explicit connection to the Research Methods unit as a rationale to "reinforce concepts" during her 'Preferred' unit.

The timing for the administration of the pre- and post-tests was controlled so that all students took the pre-test prior to content coverage in class or through assigned readings in order to gauge students' prior knowledge as accurately as possible. Likewise, the post-tests were administered prior to the teachers' final unit test in order to control for student understanding during unit instruction and not as a consequence of study for the test. Each teacher enacted different assessment practices to prepare students for AP-style questions including quizzes, final unit exams, and cumulative tests.

The issue teachers identified as a possible factor for difference in student measures of learning was related to the "timing" of the two tests. Students scored lower on the Research Methods tests because the unit was taught early in the course. Teachers also indicated "students were psychology and AP novices" as "AP Psychology was the typically the first AP course available for students."

The survey data supported the teachers claim and demonstrated that students in AP Psychology were novices with respect to psychology-related content (17.86% had taken a previous psychology course), AP course experience (24.11% had taken a previous AP course), and AP Exam experience (17.86% had taken an AP Exam). The importance of these data, through the viewpoint of the teachers, was split two ways. One possible explanation was that during the Research Methods test, the students had not "adapted to AP and the amount of study necessary for success in the course." A second possible explanation from teachers: students had not yet "mastered test-taking;" something teachers felt they could mitigate through different forms of test preparation.

John provided a cogent explanation of the testing process students endured to account for student differences in test scores:

> "By timing of the year... students evolved in their level of what is expected of them that they evolve in their level of answering questions for AP.... If you gave this same test at the end of the quarter, if you gave it in January after cum (cumulative) test two, and the final exam, how much of it is learning to take a test at this level, how to learn at this level."

This explanation offered by John provided intrigue and highlighted the explicit importance of test preparation for the teachers in the study. As such, I was motivated to see if the findings from this study generalized to the Exam performance by teachers' students in the previous year.

As mentioned in the *Overview of Teachers* from the *Sample* section of Chapter Four, these teachers were selected from recommendations and Student Grade Reports. Each teacher in the study had an Exam pass rate (score of 3 or higher) of 85% or higher: Sara (85%), John (94%), Steve (92%), Jennifer (92%), and Michelle (85%). From another vantage point, the average scores of teachers from 2010 indicated subtle differences between the teachers: Sara (M= 3.79), John (M= 4.44), Steve (M= 4.21), Jennifer (M= 4.34), and Michelle (M= 3.89). On the AP Psychology Exam for 2010, John's students had the highest average score (M= 4.44) including 64 students who scored a 5, the highest possible score on the AP Psychology Exam.

The extent to which the findings held for the teachers in the study based on previous AP Psychology Exam performance was relatively consistent. However, for John, the findings from research question three did not hold and, on the face, seem anomalous. Overall, his students performed better on the AP Psychology Exam than the students did on individual unit tests. From John's perspective, this was attributed to two factors. One, he attributed his students overall success to his extensive knowledge of the AP Psychology system of instruction and assessment based on his certification as an "Endorsed Consultant" for the College Board. Two, and as a consequence, he modified the schedule of his course to include a repetitive cycle of re-teaching content and test preparation from mid-January through the AP Psychology Exam in May. Put differently, John executed an efficient delivery of content, provided students

opportunities and examples for test preparation, and modified the schedule to accommodate practice and review specifically geared for the 100 multiple choice questions and two Free Response Questions for the AP Psychology Exam from February to the May test-date.

Compared to other teachers in the study, John's content coverage schedule and strategies for test-preparation differed greatly. For example, Sara and Michelle both taught on a block schedule. Sara's schedule was the most pressed in that she was required to cover the entire AP Psychology curriculum and test preparation from the end of January through the AP test-date in May – roughly the same amount of time that John devoted to re-teaching and test preparation. Michelle's schedule was also challenging in that the course was offered during the second and third semesters at her school. Thus, the course ended in late March/early April and forced her to offer students additional, voluntary review activities outside of school leading up to the Exam. Steve and Jennifer taught on the same seven-period day on a year-long schedule as John. However, for both, their schedule of content coverage and test preparation was consistently enacted up to the date of the Exam.

Based on the major findings from the study, I argue that teachers' ability to represent content and transform knowledge for students during instruction is an integral and perhaps the most important component of PCK for AP Psychology teachers. However, the alternative explanations for the differences in test scores, coupled with the data from teachers' Student Grade Reports on the 2010 AP Psychology Exam, challenge the notions presented and argued throughout this paper. Specifically, in John's situation, *Orientations to Teaching AP Psychology, Knowledge of AP Assessment Practices* and *Knowledge of AP Psychology Curricula* were the integral components of PCK that interacted and guided instruction. A comparison of AP Psychology Exam scores from 2010 might indicate that since John's students scored higher

than the students of other teachers his version of PCK and enactment for instruction is more efficacious.

On the other hand, the focus of this research was couched in the instructional practices of teachers, during classroom time, in two units of instruction. As indicated by the teachers, the questions on the pre- and post-tests were deemed "solid" measures of student learning and understanding for the Research Methods and 'Preferred' units of instruction. Thus, within the parameters outlined in the study, representation of content and transformation of knowledge for students, through the implementation of varied approaches and components, during in-class instruction, effectively facilitates student understanding.

Although beyond the scope of this study, John's situation draws attention to a set of broader issues related to the nature of high-stakes testing and student outcomes on the AP Exam. AP teachers face great pressure to administer practices tests and review concepts in order to prepare students for the layout of the exam and its substance (Milweski and Gillie, 2002; Paek, et. al, 2005, Paek, et. al, 2007). This pressure manifested for John in what Popham (2001) argues is a narrowing of the curriculum to spend instructional time on what is covered on the test; the exact features of John's extreme adaptation of a content coverage schedule and test preparation scheme.

The test preparation served as a catalyst for the narrowing of John's instructional approaches and components to more teacher-centered instruction (Fickel, 2006; Segall, 2006; Smith, A. M., 2006; van Hover, 2006; van Hover & Heinecke, 2005); the superficial coverage of content driven by textbooks (Gayler 2005; Jones, Jones, and Hargrove 2003; McNeil 2000; Rex and Nelson 2004; Vogler 2005, 2006a); and examples of AP Psychology Exam test questions available from his website students could access for independent practice. Moreover, the

students were subjected to instruction from late January to the test-date in May focused on tedious drill and practice specifically for the test; learning low cognitive-level content in the most time-efficient manner (Adler, Dougan, and Garcia 2006; Evans 2004; Hargrove et al. 2000; Jones, Jones, and Hargrove 2003; McNeil 2000).

The critique levied on John also serves as a possible indictment of the AP Exam and the system by which students' understanding of content is measured. Quite simply, based on previous AP Exam scores, John's content coverage schedule and test preparation scheme usurped the quality of instruction identified in this study as integral to student learning. Strictly speaking, students who learned AP Psychology content through varied instructional components and approaches teachers' employed to represent content and transform knowledge still might not perform as well on the AP Psychology Exam as students in classrooms where the teacher opts for narrowing the curricula to what is tested and test preparation.

In my view, what emerges is apprehension in reading AP Exam scores as an indicator of student learning and understanding of content; especially since important decisions are based on these one-shot, high-stakes, AP Exams. More importantly, from the data presented in this study, I hesitate to extrapolate AP Exam scores as an indicator of teachers' quality of instruction in the classroom. In some cases, like John's, AP Exam scores may be a better indicator of how to "game" the system for higher scores.

Chapter Seven: Limitations and Delimitations

While this study yields a number of valuable insights, it is always wise to consider what research cannot tell us. It is not clear if these findings are generalizable beyond the teachers of five Midwest high schools. The findings from this research are socially and historically situated; thus, how an entity acts is beyond tendencies and probabilities since events are the outcomes of complex causal configurations. The sample included five teachers and their students based on models-of-wisdom studies (Wineburg & Wilson, 1988; Ladson-Billings, 1994; Hess, 2002). The method of selection followed Shulman's (1983) recommendation that "good cases" be studied in order to learn from the possible. Thus, teachers were selected based on recommendations from experts in AP Psychology and AP Exam data (pass rate) from the previous year.

Of special consideration is that the Research Methods and teachers' 'Preferred' units within the AP Psychology program are not fixed entities and varied from site to site. Teachers had tremendous autonomy in selecting the content for instruction within units based on their belief of what was important for the AP Exam. For example, Sara and John purposefully did not choose to focus much classroom instruction on statistics during the Research Method unit compared to the other teachers in the study. Tests were developed to cover a broad range of content within units without knowledge of input from the teachers. Hence, the enacted curriculum differed across sites and teachers likely did not provide students with opportunities to learn the requisite content to successfully complete all questions and may have contributed to the difference in student test scores.

In addition, the nature of qualitative findings could be subject to other interpretations. The sources of data gathered are confined to interviews, observations, documents, and test

questions from teachers and students at five Midwest high schools. Therefore drawing conclusions about the influence of PCK on teachers' practice is challenging. PCK is difficult to capture (Loughran et. al., 2004; Morine-Dershimer & Kent, 1999; van Driel, et. al. 1998) and is dependent on the degree to which teachers have expertise in understanding a given subject area (Grossman, 1990; Meijer, et. al., 1999). Teachers were not evaluated for expertise in the content areas of the AP Psychology curriculum for the units that were researched. By focusing on the Research Methods unit and a teacher 'Preferred' unit, I may have neglected stronger content areas of teachers and possibly units that were more representative of their teaching practices.

Chapter Eight: Implications, Contributions, Suggestions

Given these limitations, however, this study does suggest several implications for teachers of AP Psychology, delivers significant contributions to the field of social studies and teacher education research, and establishes potential future directions for research.

Implications

Overall, this research sought to identify the aspects of AP Psychology teachers' PCK, how those aspects of PCK guided instruction and classroom practices, and to what extent teachers' practices contributed to student learning. Therefore, I believe it is important to begin a discussion of the implications section by focusing on the application of this research for practitioners. According to Van Driel et. al (1998), there is no universally accepted conceptualization of PCK, but researchers agree that understanding students' specific learning difficulties and knowledge of representations of the subject matter to overcome these difficulties are essential aspects of PCK. For the Research Methods unit, Steve, Jennifer, and Michelle demonstrated the important influence of their knowledge of students and knowledge of instructional strategies in their representation of the subject matter. Through the employment of a variety of student-centered approaches and components, their students performed better than those in classrooms where expository teaching and direct instruction were the main approaches.

In the Research Methods unit, there were four overarching topics: methods, experiment, statistics, and ethics. Questions on the pre- and post-tests were grouped into the four categories and analyzed to determine which classrooms demonstrated the greatest percentage growth as a consequence of the in-class instruction. Students in Steve's class showed the

highest percentage gain (33%) from pre- to post-test on questions related to methods. Within Steve's repertoire of classroom practices for teaching methods, he assigned authentic tasks for his students to collect data based on different methods and used short video clips as elaboration for the different concepts. According to Jamison (2006) and Goodwin (2002) students tend learn research methods concepts by participating in data collection. The recommendation for future instruction of research methods in psychology is to actually have the students participate in authentic tasks that model the application of the method.

This notion of student participation in an authentic task also led Steve's students to show the largest percentage increase (31.2%) on the experiment section of the unit. Steve had is students work in collaborative groups on an authentic task to complete an experiment on reaction time. The experiment was designed to be flawed and allowed Steve to connect important vocabulary terms (i.e. independent variable, dependent variable, operational definition) to students' actual classroom experience. All of the teachers in the study had students evaluate vignettes of experiments to find flaws; Steve's students were the only ones to participate in an authentic task to support learning. It follows that students learn to apply important concepts of experiments through participation in demonstrations and other authentic tasks.

For the statistics questions in the Research Methods unit, the difference between teachers who employed multiple approaches and components to represent concepts versus teachers who employed expository and direct instruction approaches cannot be understated. Michelle's students showed the largest growth in scores (25.4%) from pre- to post-test on statistics questions. On the day that she taught statistics she used a Psych-sim computer program to analyze student test-score data. In addition to providing students with visual representations and analogies she modeled how to use the program as a preview for students'

independent practice. More importantly, she provided opportunities for students to work in collaborative groups to calculate descriptive and inferential statistics. Student activity was integral in Steve and Jennifer's classes too. For all of the authentic tasks Steve had his students complete as activities to teach methods and experiments, he had his students work independently and collaboratively to calculate the appropriate statistics. Jennifer employed demonstrations as part of her pedagogical repertoire in the classroom. Students in her class participated in a visual representation of measures of central tendency and calculated descriptive and inferential statistics as part of various collaborative group work. Research recommends some forms of visual representations and simulations are types of activities and valuable tools that make some mathematical concepts easier to understand (Garfield, 1995). The recommendation for teachers is to provide opportunities for students to complete authentic tasks of collecting data and demonstrations to analyze data as part of the Research Methods unit.

The final section of the Research Methods unit is ethics. Although the teaching of ethics did not occur during the time of my observations, interviews and document analysis indicated teachers approach to ethics was discovery-based learning through components such as: independent practice (reading the textbook) and advanced organizers (APA Code of Ethics). In other words, more time was devoted to approaches and components to teach methods, experiment, and statistics during in-class instruction. Therefore, a simple recommendation is to remember to include ethics during instructional time.

In sum, include authentic tasks for students to complete during the Research Methods unit. Allow students to participate in data collection by employing different methods psychologists use in the field. Incorporate demonstrations that enable students to participate in experiments. Provide opportunities for students to visually see and physically enact the

meaning and representation of measures of central tendency and other descriptive and inferential statistics. Students traditionally struggle to learn concepts in the Research Methods unit. As the teachers in this study demonstrated, utilizing a variety of approaches and components for instruction provided opportunities for students to actively engage in the process of learning; a key attribute of PCK is the knowledge of representations of the subject matter to overcome learning difficulties.

Contributions

Pedagogical content knowledge reflects what teachers in specific disciplines and contexts should know, be able to do, and do well in order for all students to learn. It "represents a category of teacher knowledge that is the essence of an expert teacher; provides a framework that can be used to describe the origin of this critical teacher knowledge; and, is a constructivist process and therefore a continually changing body of knowledge" (Miller, 2007, p. 91). Therefore, this study adds to the body of literature by providing a framework that describes PCK in a specific discipline, during instruction of specific content; in an AP Psychology context, a course traditionally underrepresented in research (NCSS, 1991).

This study responds to the call for additional research regarding the subject-specific nature of PCK (Shulman, 1987; Grossman, 1990; Magnusson et. al, 1999; Grossman et al, 2005; and Hashweh, 2005). Specifically, the findings in this study suggest AP Psychology teachers' PCK consists of the interaction of five components: (1) orientations toward teaching AP Psychology, (2) knowledge about the AP Psychology curriculum, (3) knowledge about students' understanding of AP Psychology, (4) knowledge about assessment in AP Psychology, (5) knowledge of instructional strategies for teaching AP Psychology. It is through the interaction of these categories that teachers professional and pedagogical repertoires for

classroom practice advance. For example, teachers' knowledge about the AP Psychology curriculum and assessment (AP Exam) often limit the goals, objectives, and decision-making for planning content instruction outside of what teachers predict will be on the AP Exam.

Despite the constraints of the AP Psychology curriculum and Exam, teachers' have tremendous autonomy in the selection of content and enactment of the curriculum through instruction. Therefore, teachers must also possess strong knowledge of student understanding and knowledge of instructional strategies in order to teach subject-matter. For example, a student may demonstrate difficulty understanding concepts like reinforcement and punishment. In order for the student to learn, a teacher must represent content and transform their personal knowledge of topic-specific subject matter in ways that interact with their knowledge of student difficulties and misconceptions.

As the findings from the study indicate, AP Psychology teachers' PCK influences how the AP Psychology curriculum is enacted through classroom instruction. Specifically, the categories PCK that influence teachers' in-class pedagogical practices are: teachers' knowledge of students' understanding and knowledge of instructional strategies. Varied approaches and components for instruction, as part of teachers' pedagogical repertoires effectively facilitates student understanding. Teachers' ability to represent content and transform knowledge for students during instruction is an integral and perhaps the most important affect of PCK for AP Psychology teachers.

Psychology is one of the least researched courses in the pre-college, social studies curriculum (NCSS, 1991). The absence of relevant research in juried journals has created a barren landscape that has not kept up with psychology's popularity at the high school level. In Wisconsin, students have demonstrated success on the AP Psychology Exam and the number

of students enrolled and who take the Exam continue to grow (College Board, 2010). The general arc of research in the study of psychology at the secondary level was focused on gathering data from survey research on teacher characteristics, academic preparation of teachers, curriculum and objectives of high school psychology courses (Engle, 1952, 1967; Abrams and Stanley, 1967; Ryan, 1974; Anderson, 1965; McFadden and Pasewark, 1970; Noland, 1967; Epley and Schwerin, 1977; Wertheimer, 1973; Ragland, 1992). Albeit a small contribution, this research secures footing in the void as an applied study of classroom practices; one that has potential to effect change for better classroom instruction in AP Psychology.

It is clear that professional development opportunities through the APA, TOPSS, and the College Board are a strong influence in teachers' development of knowledge in all categories of PCK. Garet, Porter, Desimone, Birman, and Yoon (2001) suggest teachers' knowledge, skills, and classroom practices can be positively affected by professional development which includes focus on content knowledge, opportunities for active learning, and coherence with other learning activities that are consistent with the rest of the curriculum used by teachers. AP teachers have addressed concerns that the demands of the curriculum and exam force teachers to teach in ways that are incongruent with how students learn (Paek et. al, 2005; Paek et. al, 2007). Thus, teacher training and professional development in instructional strategies designed to represent content and transform knowledge through multiple approaches and components in specific subject-matter in AP Psychology should be included in order to help students develop skills of inquiry, analysis, and problem solving so that they become superior learners (National Research Council, 2002).

Suggestions

Future research should be conducted in order to advance our understanding of the influence of PCK on teacher practices in other AP Psychology classrooms and units of instruction. For example, potential sites for future research should include classrooms with a greater representation of diverse students and from other successful AP Psychology teachers. This research identified attributes of AP Psychology teachers' PCK, how the attributes guided instruction, and the extent to which the practices contributed to student understanding. In sum, the findings suggest teachers' with PCK that included a repertoire of in-class practices comprised of multiple approaches and components of instruction, contributed to student understanding of AP Psychology content. It follows that future research should include additional measurements for depth of knowledge and sustained learning of content. Based on the recommendations from the implications section, future design-based research could be developed in order to train teachers in methods of instruction shown to be efficacious in the Research Methods unit. Moreover, future research should consider the voices and experiences of students in different units of the AP Psychology Curriculum. For example, can one predict from student behavior during instruction, in what areas their achievement will be highest (and lowest)? Finally, future considerations to replicate this study in other AP courses would significantly contribute to our understanding of the influence of PCK that are unique to other disciplines.

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Appendix A: Semi Structured Interview Protocol - Teachers

Main Research Questions:

1. What are the critical attributes of AP Psychology teachers' pedagogical content knowledge?
2. In what ways does pedagogical content knowledge influence AP Psychology teachers' instruction of the Research Methods and 'Preferred' units of the AP Psychology curriculum?
3. To what extent do the instructional practices of AP Psychology teachers contribute to student learning of the content in the Research Methods and 'Preferred' units of the AP Psychology curriculum?

Knowledge of Content Area

What are the ways teachers' develop knowledge about teaching the content of the Research Methods domain in AP Psychology?

- Could you please describe your psychology history?
- What is your background and experience with the content from the Research Methods domain?
- Does your background and experience differ among other preferred units of instruction? If so, how?

What is it about the content that shapes the teaching and learning and why?

- To what extent did you experience the content of the unit as a student?
- Would you say Research Methods is one of your stronger or weaker unit/s of instruction in terms of your ability to teach students content?
    - What is the more preferred and less preferred unit/s of instruction?

Knowledge of Students

What are the ways in which teachers gain knowledge of students?

- Describe the students you typically have in your AP Psychology course in terms of student skills and knowledge.
- How do the students this year compare to years past?
- Are you aware of students' reasons or motivations for taking AP psychology? If so, what?
- Are there specific ways you ascertain student understanding or confusion around the subject matter you teach? If so, what are those ways?
- Does knowledge about student's understanding and ability to perform influence your teaching of the subject matter? If so, how?
- How do you make the content you teach appropriate to the students' level and needs?

- Does it differ between Research Methods and your more preferred units of instruction? If so, how?
- How would you describe the interaction you have with your students? How do students interact with each other?

Knowledge of Curricular Goals

What is the nature of the dimension of pedagogical content knowledge when the curricular goals are externally and internally set?

- How do you get ready to teach your instructional units each year?
- What role does planning play in your teaching of you Research Methods and your more preferred units?
- Are there any differences between getting ready for the Research Methods and your preferred units? If so, what are those differences?
- What are your goals, purposes, and objectives for this unit?
- What is the scope and sequence you envision as you plan for the unit?
- In what ways do the National Psychology Standards and AP Curriculum guide your planning?

Knowledge of Instructional Techniques and Materials

How have teachers used instructional strategies and materials to meet students' needs?

- What are the types of strategies you find are most effective in teaching content from the Research Methods and your preferred domain?
- Where did you learn those practices, or how did you come about knowing and using them?
- Describe some activities you have tried in the past that have worked well. Do you plan to use any of the activities this year?
- What are the reasons for using these specific teaching practices?
- Do those practices differ between the Research Methods and your preferred instructional units?
- What resources do you use to inform your lesson planning?
- What resources do you make available for students?
- Has the development and delivery of the content to the students changed over the years? If so, could you please describe why and how?

Knowledge of Context for Learning

What is the context in which teachers' pedagogical content knowledge is investigated?

- What are the factors outside of the classroom (i.e., school and/or district rules that govern AP Psychology; responsibilities to College Board and AP) that impact your teaching and planning?
- In what ways do your sections of AP classes differ from other classes?
- How do you establish a classroom culture for learning?
- Describe for me your general philosophy of classroom management of instructional groups and individual students, transitions within and between lessons, and the handling of materials and supplies.
- What are the behavioral expectations for students?
- Describe the rationale for organizing the physical space of your classroom.

Appendix B – Student Pre- and Post-Tests for Research Methods and Teachers' 'Preferred' Units

All Schools - Research Methods Pre-Test

1. Karthik and Sue are lab partners assigned to research who is friendlier, girls or boys. After conversing with their first 10 participants, they find that their friendliness ratings often differ. With which of the following should they be most concerned?

    a. Reliability
    b. Confounding variables
    c. Ethics
    d. Validity
    e. Assignment

2. A teacher wants to determine the role of teaching style on quiz scores. To do this, she divides a class into two groups and teaches one group using one style and the other group, using a second, different style. She then measures the score on the quizzes. The independent variable here is

    a. Group 1
    b. Group 2
    c. Teaching style
    d. Scores on quizzes
    e. Teacher

3. An educational psychologist is administering a basic skills exam to second-graders of two different schools in order to compare the students' performance. The researcher administers the exam to the students of the Antrim School on Wednesday morning, and then administers the same exam in exactly the same fashion on that same Wednesday afternoon to the second-graders of the Barton School. Which of the following best identifies a confounding variable in the psychologist's research?

    a. The psychologist is comparing two different schools
    b. The psychologist is comparing the same grade in each school
    c. The psychologist is testing the students in the two schools at two different times
    d. The psychologist is testing the students in the two schools on the same day.
    e. The psychologist is administering a basic skills exam

4. Rupert wants to learn whether men or women are better drivers. To determine this, he decides that he will measure driving ability by examining the number of tickets that people have received. Thus, he is using the number of tickets as the basis of the

    a. Control group
    b. Theory of good driving
    c. Independent variable
    d. Operational definition
    e. Experimental group

5. Which of the following represents naturalistic observation?

    a. From a third-floor window, researchers watch how elementary school children interact on a playground.
    b. Researchers bring people into a laboratory to see how they respond when asked to solve a puzzle with no solution.
    c. A principal sits in the back of a classroom to evaluate a teacher.
    d. A social worker spends the afternoon in the home of a mother accused of neglecting her children.
    e. Two grandparents sit in the front row to watch as their grandson performs his piano recital.

6. Psychologists generally prefer the experimental method to other research methods because

    a. Experiments are more likely to support psychologists' hypotheses
    b. Experiments can show cause-effect relationships
    c. It is easier to obtain a random sample for an experiment
    d. Double-blind designs are unnecessary in an experiment
    e. Experiments are more likely to result in statistically significant findings

7. One's ability to make inferences about the behavior of a population from the behavior of a sample population is referred to as

    a. Reliability
    b. Generalizability
    c. Internal validity
    d. Inter-rater reliability
    e. Correlational statistical inference

8. Why is random assignment of participants to groups an important aspect of a properly designed experiment?

    a. If the participants are randomly assigned, the researchers can assume that the people in each of the groups are pretty similar.
    b. By randomly assigning, the researcher knows that whatever is learned from the experiment will also be true for the population from which the participants were selected.
    c. Random assignment keeps expectations from influencing the results of the experiment.
    d. If the participants are not randomly assigned, it is impossible to replicate the experiment.
    e. Statistical analysis cannot be performed on an experiment if random assignment is not used.

9. Suppose you wanted to study the effects of dopamine on the amount of exercise in a rat. In such an experiment, the dependent variable would be

    a. Amount of dopamine
    b. The rat
    c. The groups of rats
    d. The amount of exercise
    e. The number of rats in the groups

10. Let's say a psychology researcher is interested in testing whether a particular parenting technique would lead adolescents to feel more satisfied with their lives. What method should be used?

    a. Case study
    b. Experiment
    c. Survey
    d. Naturalistic observation
    e. Correlation

11. Sandy scores a perfect 100 on a test that everyone else fails. If we were to graph this distribution, it would be

    a. Symmetrical
    b. Normal
    c. Positively skewed
    d. Negatively skewed
    e. A straight line

12. A researcher asks elementary, middle school, high school, and college students to define the term "cheating" and analyzes differences in their definitions across age groups. This is an example of which type of study?

    a. Longitudinal
    b. Sequential
    c. Cross-sectional
    d. Case study
    e. Observational

13. Inferential statistics is used to

    a. Establish strength of relationship
    b. Establish cause and effect
    c. Generalize to the population
    d. Describe a data set
    e. Formulate hypotheses

14. The _____ approves research done by psychologists at most universities.

    a. Watchdog committee
    b. Ethics review committee
    c. Research committee
    d. Institutional review board
    e. Research review board

15. According to the ethical principles of doing psychological research, which of the following would not likely be allowed?

    a. Participants are deceived, but eventually debriefed
    b. Participants are given informed consent, but are deceived
    c. Participants are not given informed consent, but are debriefed
    d. Participants are given full disclosure, but are not able to tell the independent from the dependent variable
    e. Participants are not told what to expect, but are given informed consent and debriefed

16. If Sarah scored one standard deviation above the average, _____ percentage of the population scored higher than she did.

a. 15%
b. 25%
c. 50%
d. 65%
e. 95%

17. Which of the following is a potential problem with case studies?

a. They provide too much detail and the researcher is likely to lose track of the most important facts.
b. They are generally too expensive to be economical.
c. They may be misleading because they don't fairly represent other cases.
d. They are technically difficult and most researchers don't have the skills to do them properly.
e. The dependent variable is difficult to operationally define in a case study.

18. If the variance of a set of scores is 100, the standard deviation will be

a. 5
b. 10
c. 25
d. 50
e. 125

19. Which of the following is the most commonly used measure of central tendency?

a. Correlation
b. Mean
c. Median
d. Standard deviation
e. Mode

20. Which of the following sets of scores has the greatest standard deviation?

a. 5, 7, 9, 12
b. 2, 7, 9, 22
c. 25, 27, 29, 32
d. 50, 51, 52, 53
e. 100, 101, 101, 102, 103

All Schools - Research Methods Post Test

1. When a distribution of scores is skewed, the best representation of central tendency is the

   a. Inference
   b. Standard deviation
   c. Mean
   d. Median
   e. Correlation coefficient

2. Control is essential in psychological research. Which of the following research methods procedure has the most control?

   a. Correlational study
   b. Experiment
   c. Observation study with participation
   d. Observation study without participation
   e. Operationalization

3. What statistical technique would be appropriate for a researcher to use in trying to determine how consistent intelligence scores are over time?

   a. Correlation coefficient
   b. Mean
   c. Median
   d. Standard deviation
   e. Range

4. Jen collects survey data that indicates that students who spend more time preparing for the AP test tend to score better than other students. Jen can now conclude that

   a. Studying improves exam grades
   b. A relationship exists between studying and exam grades
   c. A significant correlation exist between studying and exam grades
   d. Anyone who does not study will do poorly on the exam.
   e. Better students tend to study more

5. Some psychologists consider Stanley Milgram's obedience studies to be unethical because of which ethical consideration?

a. Improper sampling procedure
b. Risk of long-term harm
c. Clear scientific purpose
d. Debriefing
e. Anonymity

6. Dr. Jordan believes there is a relationship between the amount of chocolate a child eats and the hyperactivity level of the child. This belief is a(n) _____.

a. Theory
b. Variable
c. Hypothesis
d. Paradigm
e. Premise

7. Deception is allowed by the APA Code of Ethics if _____.

a. The problem being studied is really important
b. The participants are thoroughly debriefed
c. The researcher is confident about his or her study
d. No substantial risk is likely to happen to participants
e. This study is replicating a previously completed study

8. Which of the following would be used to measure the relationship between age and reaction time?

a. Correlation
b. Central tendency
c. A histogram
d. Standard deviation
e. T-test

9. A teacher wants to determine the role of teaching style on quiz scores. To do this, she divides a class into two groups and teaches one group using one style and the other group, using a second, different style. She then measures the score on the quizzes. The independent variable here is

    a. Group 1
    b. Group 2
    c. Teaching style
    d. Scores on quizzes
    e. Teacher

10. Which of the following sets of scores has the greatest standard deviation?

    a. 5, 7, 9, 12
    b. 2, 7, 9, 22
    c. 25, 27, 29, 32
    d. 50, 51, 52, 53
    e. 100, 101, 101, 102, 103

11. Which of the following is a positive correlation?

    a. As study time decreases, students achieve lower grades
    b. As levels of self-esteem decline, levels of depression increase
    c. People who exercise regularly are less likely to be obese
    d. Gas mileage decreases as vehicle weight increases
    e. Repeatedly shooting free throws is associated with smaller percentage of missed free throws

12. Suppose you wanted to study the effects of dopamine on the amount of exercise in a rat. In such an experiment, the dependent variable would be

    a. Amount of dopamine
    b. The rat
    c. The groups of rats
    d. The amount of exercise
    e. The number of rats in the groups

13. Luis conducted a study of the attitudes and savings behavior. He followed 100 participants for 10 years. Luis conducted a _____ study.

a. Longitudinal
b. Ex-post facto
c. Experimental
d. Cross-sectional
e. Cross-sequential

14. If the variance of a set of scores is 100, the standard deviation will be

a. 5
b. 10
c. 25
d. 50
e. 125

15. For a language test with normally distributed scores, the mean was 70 and the standard deviation was 10. Approximately what percentage of test takers scored 60 and above?

a. 16
b. 34
c. 68
d. 84
e. 95

16. Assume you take the SAT and score 2 standard deviations above the average. You scored better than _____ of the population.

a. 15%
b. 25%
c. 50%
d. 65%
e. 95%

17. Which of the following hypotheses would be most difficult to test experimentally?

a. People exposed to the color red will be more aggressive than those exposed to the color blue
b. Exercise improves mood
c. Exposure to violent television increases aggression
d. Studying leads to better grades
e. Divorce makes children more independent

18. A negative correlation typically means

    a. Variables are related inversely
    b. Variables are related directly
    c. Variables are unrelated
    d. Variables are only weakly related
    e. Variables are strongly related

19. Which of the following is the most commonly used measure of central tendency?

    a. Correlation
    b. Mean
    c. Median
    d. Standard deviation
    e. Mode

20. Rupert wants to learn whether men or women are better drivers. To determine this, he decides that he will measure driving ability by examining the number of tickets that people have received. Thus, he is using the number of tickets as the basis of the _____.

    a. Control group
    b. Theory of good driving
    c. Independent variable
    d. Operational definition
    e. Experimental group

School 1 – 'Preferred' Unit: Social Psychology Post-Test

1. Advertisements are made more effective when the communicators are
    i. Attractive
    ii. Famous
    iii. Perceived as experts

    a. II only
    b. III only
    c. I and II
    d. II and III
    e. I, II, and III

2. An old woman carrying a number of packages has tripped and fallen on a busy urban sidewalk and is having trouble getting back up. The fact that few people are likely to stop and offer her help is referred to by social psychologists as an example of
    a. Illusory correlation
    b. Diffusion of responsibility
    c. Cognitive dissonance
    d. Altruistic orientation
    e. Just-world bias

3. When Pasquale had his first oboe solo in the orchestra concert, his performance was far worse than it was when he rehearsed at home. A phenomenon that helps explain Pasquale's poor performance is known as
    a. Social loafing
    b. Groupthink
    c. Deindividuation
    d. Social impairment
    e. Diffusion of responsibility

4. Rosenthal and Jacobson's "Pygmalion in the Classroom" study showed that
    a. People's expectations of others can influence the behavior of those others
    b. Attitudes are not always good predictors of behavior
    c. Contact is not sufficient to break down prejudices
    d. People like to think that others get what they deserve
    e. Cohesive groups often make bad decisions

5. The fact that we attribute our success to internal causes and failure to external causes is called
    a. Fundamental attribution error
    b. Actor-perceiver bias
    c. Self-serving bias
    d. Groupthink
    e. Self-fulfilling prophecy

6. In his famous study on obedience, Milgram argued that people
    a. Were obedient because they were men
    b. Were obedient because of the situation
    c. Were not obedient because the requests were unreasonable
    d. In general do what they this is right
    e. Today typically do not listen to authorities

7. Suppose you need help with a homework assignment. You ask your friend, and she agrees. You end up doing very well on the assignment. Later, your friend needs a ride to the airport. Even though you are busy, you agree. This is an example of
    a. Social loafing
    b. Deindividuation
    c. Obedience
    d. Conformity
    e. Reciprocity

8. The "fundamental attribution error" phenomenon can best be seen in the following example:
    a. John blames his failure to get a job on his lack of appropriate skills and ill-preparedness
    b. Phyllis doesn't get the lead in the school play and blames her drama teacher for this failure.
    c. Jane blames herself for forgetting that she has a term paper due in two days.
    d. Bill doesn't hire John, because John was a half-hour late for his interview and Bill believes that John's lateness is a result of his laziness and lack of respect for the job. In reality John was a late because he got a flat tire on the way to the interview.
    e. Karen understands that her friend is late because she was caught in rush-hour traffic.

9. We are sometimes persuaded to do something that we wouldn't normally do. Which of the following is a considered to be important as a persuasive tool?
    a. Source of the information
    b. Accuracy of the information
    c. Direct orders
    d. Subliminal messages
    e. Backward masking

10. On their second date, Megan confides in Francisco that she still loves to watch *Rugrats*. He, in turn, tells her that he still cries when he watches *Bambi*. These two young lovers will be brought closer together through this process of
    a. Self-disclosure
    b. Deindividuation
    c. In-group bias
    d. Dual sharing
    e. Open communication

11. In Asch's conformity study, approximately what percentage of participants gave at least one incorrect response?

a. 30
b. 40
c. 50
d. 60
e. 70

12. Which of the following would illustrate the "foot-in-the-door" technique of facilitating compliance with a request?
    a. A professional fundraiser, needing to get $10,000 from a foundation, first requests four times that amount, expecting to be turned down so that she can then ask for the lesser amount.
    b. A teenager, wanting to extend his curfew from 10:00pm to midnight, first asks if it can be extended to 11:00pm for a specific "special" occasion; he then plans to ask for the further extension at a later date after pointing out to his parents he was able to handle the 11:00pm curfew.
    c. A mother wishing to get her twins to do their homework each day upon coming home from school and before other activities tells each of them separately that the other twin has agreed to do just that.
    d. An interviewee desperately needing to get a new job researches the mode of dress in each company he lands an interview with and always shows up at the meeting in that exact mode of dress.
    e. A teacher wishing all her students to get their assignments in on time promises her class extra grading points for turning them in early.

13. If we help someone simply for the sake of helping, this is called
    a. Bystander effect
    b. Altruism
    c. Social loafing
    d. Deindividuation
    e. Obedience

14. The fact that we attribute our errors to the environment and other people's errors to internal causes is called
    a. Fundamental attribution error
    b. Actor-perceiver bias
    c. Self-serving bias
    d. Groupthink
    e. Self-fulfilling prophecy

15. In the Milgram studies, the dependent measure was
    a. The highest level of shock supposedly administered
    b. The location of the learner

c. The length of the line
d. The number of people in the group
e. The instructions given by the experimenter

16. The idea that someone is willing to commit aggressive acts when he is in a group because there is no immediate consequence for his behavior is called
    a. Groupthink
    b. Social loafing
    c. Deindividuation
    d. Obedience
    e. Social facilitation

17. If we change our behavior but not our attitude, this is an example of
    a. Private conformity
    b. Obedience
    c. Social facilitation
    d. Public conformity
    e. Persuasion

18. On the first day of class, Mr. Simpson divides his class into four competing groups. On the fifth day of school, Jody is sent to the principal for kicking members of the other groups. Mr. Simpson can be faulted for encouraging the creation of
    a. Group polarization
    b. Deindividuation
    c. Out-group bias
    d. Superordinate goals
    e. Groupthink

19. The fact that people are not likely to help someone if they are in a large group is called the
    a. Foot-in-the-door.
    b. Bystander effect
    c. Obedience effect
    d. Conformity
    e. Compliance effect

20. The fundamental attribution error occurs when someone attributes causes
    a. To the environment
    b. To the person
    c. To the group process
    d. To groupthink
    e. To sociocultural variables

School 2 – 'Preferred' Unit: Learning Pre-Test

1. Which is a definition of discrimination that most directly applies to classical conditioning?
    a. Prototype matching to organize information into categories
    b. Maintaining information in memory through repetition
    c. Differential treatment, usually negative, based on group membership
    d. Recognizing an object as distinct from its surroundings
    e. Learning to respond differently to different stimuli

2. To determine just what an organism can learn to distinguish, you would use
    a. Generalization
    b. A variable ratio schedule of reinforcement
    c. A fixed ratio of reinforcement
    d. Extinction
    e. A discriminative stimulus

3. The lights in your house went out and it was pitch dark in your house. You were able to navigate to the kitchen because of a _____ map.
    a. Navigation
    b. Cognitive
    c. Memory
    d. Representation
    e. Environmental

4. Mary checks her phone a couple of times an hour for incoming text messages. Her behavior is being maintained on a _____ reinforcement schedule.
    a. Fixed interval
    b. Variable interval
    c. Variable ratio
    d. Fixed ratio
    e. Continuous

5. Latent learning is best described by which of the following?
    a. Innate responses of an organism preventing new learning and associations
    b. Unconscious meaning that is attributed to new response patterns
    c. Response patterns that become extinguished gradually over time
    d. Delayed responses that occur when new stimuli are paired with familiar ones
    e. Learning that occurs in the absence of rewards

6. Robert Rescorla and Allan Wagner conducted experiments that established
    a. That the acquisition of a CR depends on pairing the CS and the US.

b. That different species respond differently to classical conditioning situations
c. The current belief that classical conditioning is really a form of operant conditioning
d. That mirror neurons form the biological basis of classical conditioning
e. That importance of cognitive factors in classical conditioning

7. Which of the following is an application of shaping?
   a. A mother playing catch with her daughter gradually backs up to increase the distance between the two of them
   b. A pigeon pecks a disk 25 times for an opportunity to receive a food reinforcement
   c. A rat presses a bar when a green light is on but not when a red light is on
   d. A rat gradually stops pressing a bar when it no longer receives a food reinforcement
   e. A gambler continues to play a slot machine even though he has won nothing on his last 20 plays

8. The psychologist who is responsible for developing the framework of operant conditioning was
   a. Pavlov
   b. Skinner
   c. Watson
   d. Bandura
   e. Freud

9. Witnessing the reinforcement of someone else's behavior has been found to increase the likelihood of that behavior in the witness. This is referred to as
   a. Differential reinforcement
   b. Shaping
   c. Vicarious reinforcement
   d. Habituation
   e. Instinctual drift

10. Your teacher says that if everyone stays quiet for the next thirty minutes, the class would have no homework. This is an example of _____.
    a. Positive reinforcement
    b. Negative reinforcement
    c. Classical conditioning
    d. Positive punishment
    e. Negative punishment

11. Dr. Susie has a client who is exhibiting an undesirable conditioned fear. Dr. Susie decides to try a therapeutic strategy called _____ conditioning to extinguish the response.
    a. Appetitive

b. Aversive
c. Reflex
d. Stimulus
e. Counter

12. A boy is given candy each time he studies for an hour. Eventually his parents observe an increase in studying behavior. This is an example of
    a. Positive reinforcement
    b. Negative punishment
    c. Positive punishment
    d. Shaping
    e. Negative reinforcement

13. Jamel got very sick after eating some mushrooms on a pizza at his friend's house. He didn't know that he had a stomach virus at the time, blamed his illness on the mushrooms, and refused to eat them again. Which of the following is the unconditioned stimulus for his taste aversion to mushrooms?
    a. Pizza
    b. Stomach virus
    c. Mushrooms
    d. Headache
    e. Aversion to mushrooms

14. One of the biggest differences between negative reinforcement and punishment is that
    a. Only punishment involves the use of averse stimuli
    b. Only negative reinforcement involves the use of averse stimuli
    c. Negative reinforcement increases the likelihood of a desired behavior
    d. Punishment increases the likelihood of a desired behavior
    e. Negative reinforcement decreases the likelihood of a desired behavior

15. According to Skinner, the most important environmental aspect that controls human behavior is the
    a. Antecedents of the behavior
    b. Consequences of the behavior
    c. Strength of the behavior
    d. Amount of punishment
    e. Amount of reinforcement

16. Once Pavlov's dogs learned to salivate to the sound of a tuning fork, the tuning fork was a(n)
    a. Unconditioned stimulus
    b. Neutral stimulus

c. Conditioned stimulus
d. Unconditioned response
e. Conditioned response

17. Albert Bandura's Bobo doll experiments demonstrated that
    a. Children are likely to imitate the behavior of adults
    b. There may be a correlation between televised violence and aggressive behavior, but it is probably not a cause-effect relationship
    c. Children are more likely to copy what adults say than what adults do
    d. Allowing children to watch too much television is detrimental to their development
    e. Observational learning can explain the development of fears in children

18. After seeing her parents give her brother a dollar for cleaning his room, Sarah begins cleaning her own room. According to social-learning theorists, Sarah's behavior is an example of which of the following?
    a. Classical conditioning
    b. Spontaneous recovery
    c. Stimulus generalization
    d. Discrimination training
    e. Observational learning

19. Chimpanzees given tokens for performing tricks were able to put the tokens in vending machines to get grapes. The tokens acted as
    a. Primary reinforcers
    b. Classical conditioning
    c. Secondary reinforcers
    d. Negative reinforcers
    e. Unconditioned reinforcers

20. John loves to fish. He puts his line in the water and leaves it there until he feels a tug. On what reinforcement schedule is he rewarded?
    a. Continuous reinforcement
    b. Fixed ratio
    c. Fixed interval
    d. Variable ratio
    e. Variable interval

School 2 – 'Preferred' Unit: Learning Post-Test

1. The tendency for stimuli similar to a conditioned stimulus to elicit the conditioned response is referred to as
    a. Response bias

b. Generalization
c. Extinction
d. Priming
e. Blocking

2. The lights in your house went out and it was pitch dark in your house. You were able to navigate to the kitchen because of a _____ map.
   a. Navigation
   b. Cognitive
   c. Memory
   d. Representation
   e. Environmental

3. Kohler's study of chimpanzees suggests that they reorganize their perception, a mental process he called _____ learning.
   a. Operant
   b. Latent
   c. Classical
   d. Insight
   e. Perceptual

4. Every time a tone sounds, a participant has a puff of air blown into her eye. This causes the person to twitch. After a while, the participant twitches as soon as the tone sounds. The twitching is caused by the air puff is called
   a. The conditioned stimulus
   b. The unconditioned response
   c. The unconditioned stimulus
   d. The conditioned response
   e. Habituation

5. Which of the following illustrates generalization?
   a. A rabbit that has been conditioned to blink to a tone also blinks when a similar tone is sounded.
   b. A dog salivates to a tone but not to a buzzer.
   c. A light is turned on repeatedly until a rat stops flexing its paw when it's turned on.
   d. A pigeon whose disk pecking response has been extinguished is placed in a Skinner box three hours later and begins pecking the disk again.
   e. A child is startled when the door-bell rings.

6. A student studies long and hard to avoid the bad feelings associated with a low grade on a test. In this case, the studying behavior is being strengthened because of
   a. Positive reinforcement

b. Negative reinforcement
c. Delayed reinforcement
d. Primary reinforcement
e. Conditioned reinforcement

7. Albert Bandura's Bobo doll experiments demonstrated that
   a. Children are likely to imitate the behavior of adults
   b. There may be a correlation between televised violence and aggressive behavior, but it is probably not a cause-effect relationship
   c. Children are more likely to copy what adults say than what adults do
   d. Allowing children to watch too much television is detrimental to their development
   e. Observational learning can explain the development of fears in children

8. John loves to fish. He puts his line in the water and leaves it there until he feels a tug. On what reinforcement schedule is he rewarded?
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   b. Fixed ratio
   c. Fixed interval
   d. Variable ratio
   e. Variable interval

9. Which of the following is an application of shaping?
   a. A mother playing catch with her daughter gradually backs up to increase the distance between the two of them
   b. A pigeon pecks a disk 25 times for an opportunity to receive a food reinforcement
   c. A rat presses a bar when a green light is on but not when a red light is on
   d. A rat gradually stops pressing a bar when it no longer receives a food reinforcement
   e. A gambler continues to play a slot machine even though he has won nothing on his last 20 plays

10. An example of a fixed-interval schedule of reinforcement is
    a. A dog getting a treat every time it sits on command
    b. Winning money at a slot machine
    c. Getting paid for each widget you sell
    d. Being paid by the week
    e. Getting a reward for good behavior once in a while

11. Chimpanzees given tokens for performing tricks were able to put the tokens in vending machines to get grapes. The tokens acted as
    a. Primary reinforcers
    b. Classical conditioning
    c. Secondary reinforcers
    d. Negative reinforcers

e. Unconditioned reinforcers

12. Lilly is eating a hot dog. Shortly after eating the hot dog, she comes down with the flu. After this, Lilly hates eating hot dogs. Even the thought makes her sick. In this example, the flu is
    a. Generalized
    b. The unconditioned response
    c. The unconditioned stimulus
    d. The conditioned stimulus
    e. The consequence

13. A monkey is conditioned to flinch at the sound of a bell that was previously paired with a puff of air to the monkey's cheek. Which of the following explanations would be consistent with a cognitive interpretation of this conditioning?
    a. The animal cannot control its tendency to flinch because the response of flinching is simply a reflex to the bell.
    b. The strength of the flinch response is a function of the time interval between the onset of the bell and the puff of air.
    c. The monkey interprets the bell as a signal that the air puff will follow.
    d. The bell is merely a substitute stimulus for the air puff.
    e. Monkeys are intelligent and know that they should flinch when they hear tones that air paired with stimuli that elicit reflexes.

14. Rats were more likely to learn an aversion to bright lights and noise with water if they were associated with electric shocks rather that with flavors or poisoned food. This illustrates
    a. Insight
    b. Preparedness
    c. Extinction
    d. Observational learning
    e. Generalization

15. Every time Reynaldo does well on his report card, his parents take him out for ice cream. This is an example of
    a. Negative reinforcement
    b. Negative punishment
    c. Positive punishment
    d. Habituation
    e. Positive reinforcement

16. Classical conditioning and operant conditioning differ in that
    a. Classical conditioning deals with voluntary behavior

b. Operant conditioning deals with reflexive behavior
c. Classical conditioning deals with shaping
d. Classical conditioning deals with reflexive behavior
e. Operant conditioning does not work in most situations

17. Which of the following best reflects negative reinforcement?
    a. Teresa is scolded when she runs through the house yelling
    b. Lina is not allowed to watch television until after she has finished her homework
    c. Greg changes his math class so he doesn't have to see his old girlfriend
    d. Aditya is praised for having the best essay in the class
    e. Alex takes the wrong medicine and gets violently ill afterwards.

18. After seeing her parents give her brother a dollar for cleaning his room, Sarah begins cleaning her own room. According to social-learning theorists, Sarah's behavior is an example of which of the following?
    a. Classical conditioning
    b. Spontaneous recovery
    c. Stimulus generalization
    d. Discrimination training
    e. Observational learning

19. The type of learning in which association plays a major role is _____.
    a. Classical conditioning
    b. Instinctual learning
    c. Operant conditioning
    d. Social learning
    e. Insight learning

20. Once Pavlov's dogs learned to salivate to the sound of a tuning fork, the tuning fork was a(n)
    a. Unconditioned stimulus
    b. Neutral stimulus
    c. Conditioned stimulus
    d. Unconditioned response
    e. Conditioned response

School 3 – 'Preferred' Unit: Biopsychology Pre-Test

1. The threshold of excitation is
    a. 65 millivolts
    b. -65 millivolts
    c. 70 millivolts

d. 90 millivolts
e. -70 millivolts

2. When brain researchers refer to *brain plasticity* they are talking about
   a. The brain's ability to quickly regrow damaged neurons
   b. The surface texture and appearance caused by the layer known as the cerebral cortex
   c. The brain's versatility caused by the millions of different neural connections
   d. Our adaptability to different problems ranging from survival needs to abstract reasoning
   e. New connections forming in the brain to take over for damaged sections

3. During a softball game, you are hit in the head with the ball. Your vision becomes blurred. What region of the brain was MOST likely involved?
   a. Hindbrain
   b. Occipital lobe
   c. Temporal lobe
   d. Midbrain
   e. Parietal lobe

4. Which of the following must be males?
   a. Dizygotic twins
   b. Monozygotic twins
   c. Down syndrome children
   d. Klinefelter's syndrome children
   e. Turner's syndrome children

5. Of the following, which are located exclusively in the central nervous system?
   a. Afferent neurons
   b. Interneurons
   c. Efferent neurons
   d. Gilal cells
   e. Effectors

6. Morphine is a chemical that mimics the action of endorphins. Morphine is a(n)-_____.
   a. Endorphin agonist
   b. Endorphin antagonist
   c. Dopamine agonist
   d. Serotonin antagonist
   e. Serotonin agonist

7. Evolutionary psychologists seek to understand how traits and behavioral tendencies have been shaped by
    a. Natural selection
    b. Genes
    c. Prenatal nutrition
    d. DNA
    e. Chromosomes

8. The part of the brain most closely associated with maintaining balance and the coordination of complex sequences of movements is the
    a. Hypothalamus
    b. Thalamus
    c. Pons
    d. Medulla
    e. Cerebellum

9. Mr. Spam is a 39-year-old male who has been brought into your neurology clinic by his wife. She has become increasingly alarmed by her husband's behavior over the last four months. You recommend a CAT scan to look for tumors in the brain. Which two parts of the brain would you predict are being affected by the tumors? List of symptoms: vastly increased appetite, body temperature fluctuations, decreased sexual desire, jerky movements, poor balance when walking and standing, inability to throw objects, and exaggerated efforts to coordinate movements in a task.
    a. Motor cortex and emotion cortex
    b. Somato-sensory cortex and hypothalamus
    c. Hypothalamus and cerebellum
    d. Cerebellum and medulla
    e. Thalamus and motor cortex

10. Blindness could result from damage to which cortex and lobe of the brain?
    a. Visual cortex in the frontal lobe
    b. Visual cortex in the temporal lobe
    c. Sensory cortex in the parietal lobe
    d. Visual cortex in the occipital lobe
    e. Cerebral cortex in the occipital lobe

11. The most commonly used animal model in physiological psychology is the
    a. Dog
    b. Rat
    c. Cat
    d. Monkey
    e. Dolphin

12. Which sentence most closely describes neural transmission?
    a. An electric charge is created in the neuron, the charge travels down the cell, and chemicals are released that cross the synapse to the next cell
    b. A chemical change occurs within the cell, the change causes an electric charge to be produced, and the charge jumps the gap between the nerve cells
    c. The electric charge produced chemically inside a group of neurons causes chemical changes in surrounding cells
    d. Neurotransmitters produced in the hindbrain are transmitted to the forebrain, causing electric changes in the cerebral cortex
    e. Neural transmission is an electrochemical process both inside and outside the cell

13. What ion is concentrated outside the cell membrane when a cell is at rest?
    a. Oxygen
    b. Nitrogen
    c. Potassium
    d. Sodium
    e. Chloride

14. Gunshot wounds tumors, and strokes all result in
    a. Infections
    b. Significant loss of function
    c. Lesions
    d. Pain
    e. Necessity for surgery

15. The _____ seems to be responsible for motivation
    a. Occipital lobe
    b. Temporal lobe
    c. Thalamus
    d. Hypothalamus
    e. Cerebral cortex

16. Thomas Bouchard's study of twins is notable because
    a. It demonstrated that peer influence is more important than parental influence in the development of personality traits
    b. It proved that the influence of parental environment becomes more and more important as children grow into adults
    c. He discovered almost unbelievable similarities between adult identical twins who had been separated near birth

d. Fraternal twins showed almost as much similarity as identical twins when they reached adulthood
e. It provided evidence that heritability is less important than researchers previously suspected

17. Ashley is a 20 year old woman who cannot remember her street address and is having trouble learning new things. Her neurologist will focus on her _____.
    a. Thalamus
    b. Hypothalamus
    c. Amygdale
    d. Medulla
    e. Hippocampus

18. You eat some bad sushi and feel that you are slowly losing control over your muscles. The bacteria you ingested from the bad sushi most likely interferes with the use of
    a. Serotonin
    b. Insulin
    c. Acetylcholine
    d. Thorazine
    e. Adrenaline

19. Scientists are able to see changes in the brain as it processes information by means of
    a. Lesioning
    b. Autopsy
    c. CT
    d. MRI
    e. PET

20. Which of the following is *not* one of the main criticisms of the evolutionary psychology explanation of human sexuality?
    a. This perspective starts with an effect and works backward to propose an explanation
    b. This perspective discounts important genetics influences
    c. Unethical and immoral men could use such explanations to rationalize their behavior toward women
    d. This explanation overlooks the effects of cultural expectations and socialization
    e. This explanation does not consider the importance of individual choices in any given situation

School 3 – 'Preferred' Unit: Biopsychology Post-Test

1. The part of the brain most closely associated with maintaining balance and the coordination of complex sequences of movements is the
    a. Hypothalamus
    b. Thalamus
    c. Pons
    d. Medulla
    e. Cerebellum

2. Evolutionary psychologists seek to understand how traits and behavioral tendencies have been shaped by
    a. Natural selection
    b. Genes
    c. Prenatal nutrition
    d. DNA
    e. Chromosomes

3. Neurosurgeons cut the corpus callosum in the brain disrupting communication between the right and left hemispheres to
    a. Prevent the spread of epileptic seizures
    b. Reduce anxiety attacks and phobic reactions
    c. Reduce the incidence of violent behaviors
    d. Treat schizophrenia
    e. Reduce mood swings

4. Which includes all of the others?
    a. Autonomic nervous system
    b. Peripheral nervous system
    c. Somatic nervous system
    d. Parasympathetic nervous system
    e. Sympathetic nervous system

5. During a softball game, you are hit in the head with the ball. Your vision becomes blurred. What region of the brain was MOST likely involved?
    a. Hindbrain
    b. Occipital lobe
    c. Temporal lobe
    d. Midbrain
    e. Parietal lobe

6. Blindness could result from damage to which cortex and lobe of the brain?
    a. Visual cortex in the frontal lobe
    b. Visual cortex in the temporal lobe
    c. Sensory cortex in the parietal lobe
    d. Visual cortex in the occipital lobe
    e. Cerebral cortex in the occipital lobe

7. According the theory of evolution, why might we call some parts of the brain the old brain and some parts the new brain?
    a. Old brain parts are what exist in very young children, and the new brain develops later
    b. The old brain developed first according to evolution
    c. The old brain becomes more active as we grow older
    d. The new brain deals with new information, while the old brain deals with information gathered when we were children
    e. The old brain is most affected by age deterioration (dementias) while the new brain remains unaffected

8. Scientists are able to see changes in the brain as it processes information by means of
    a. Lesioning
    b. Autopsy
    c. CT
    d. MRI
    e. PET

9. The human vestibular sense is most closely associated with the
    a. Skin
    b. Semicircular canals
    c. Taste buds
    d. Olfactory bulb
    e. Rods and cones

10. Damage to the hippocampus would result in
    a. Difficulties with balance and coordination
    b. Memory problems
    c. The false sensation of burning in parts of the body
    d. Emotional outbursts
    e. Death

11. The human brain differs from the brains of most animals by the relative amount of brain mass devoted to which of the following?
    a. The occipital lobe

b. The cerebellum
c. The cerebral cortex
d. The homunculus
e. The pituitary gland

12. You eat some bad sushi and feel that you are slowly losing control over your muscles. The bacteria you ingested from the bad sushi most likely interferes with the use of
    a. Serotonin
    b. Insulin
    c. Acetylcholine
    d. Thorazine
    e. Adrenaline

13. Which of the following statements is true regarding genetics and an individual's psychological characteristics?
    a. Genetics has contributed little to the understanding of human behavior and metal processes
    b. Genetics only influences behavior, not mental processes
    c. Genetics only influences mental processes, not behavior
    d. Psychological characteristics are attributed to genetics alone
    e. Psychological characteristics are not attributed to genetics alone

14. When a neuron fires and its electric charge travels down the axon, causing neurotransmitters to be released by the neuron's terminal buttons, a(n) _____ happens.
    a. Action threshold
    b. Action potential
    c. Reuptake
    d. Resting potential
    e. Synaptic transmission

15. The brain seems to have _____ neurons
    a. 1 million
    b. 2 billion
    c. 1.5 trillion
    d. 2.5 trillion
    e. 1.5 billion

16. The part of the brain that seems to be responsible for receiving sensory information from the environment is called the _____.
    a. Motor cortex
    b. Somatosensory cortex

c. Sensory memory
d. Receptive field
e. Limbic system

17. The three major categories researchers use to organize the entire brain are the
    a. Old brain, new brain, and cerebral cortex
    b. Lower, middle, and upper brain
    c. Hindbrain, midbrain, and forebrain
    d. Brain stem, limbic system, and cerebral cortex
    e. Neurons, synapses, and cerebral cortex

18. Which of the following is considered the fundamental building block of the nervous system?
    a. Nucleus
    b. Neuron
    c. Synapse
    d. Neurotransmitter
    e. Electrical impulse

19. When brain researchers refer to *brain plasticity* they are talking about
    a. The brain's ability to quickly regrow damaged neurons
    b. The surface texture and appearance caused by the layer known as the cerebral cortex
    c. The brain's versatility caused by the millions of different neural connections
    d. Our adaptability to different problems ranging from survival needs to abstract reasoning
    e. New connections forming in the brain to take over for damaged sections

20. Mr. Jenkins' suffered a "stroke" as a result of a brain injury. Although he can sill move the fingers on his right hand, he has lost sensation in these parts. Of the following, the site of damage to his brain is most likely in the
    a. Right frontal lobe
    b. Right temporal lobe
    c. Left frontal lobe
    d. Left parietal lobe
    e. Hypothalamus

Schools 4 & 5 – 'Preferred' Unit: Development Pre-Test

1. Now that Sally is six years old, she is better able to empathize with her friend's feeling than she did when she was three years old. Sally is acquiring a(n)_____.
    a. Self-concept
    b. Schema

c. Temperament
d. Theory of mind
e. Assimilation

2. In the nature versus nurture controversy, "nature" refers to
   a. Heredity
   b. Plants and animals
   c. All living things we interact with
   d. Constituents of the problem
   e. The environment

3. The sense of when to leave home, get a job, or marry is also referred to as the
   a. Social clock
   b. Midlife crisis
   c. Critical period
   d. Life span
   e. Theory of mind

4. The gap between the skills that children have the ability to do alone versus that which they can do with support is called
   a. Adaptation
   b. Zone of proximal development
   c. Scaffolding
   d. Equilibration
   e. Accommodation

5. According to Piaget, basic knowledge structures are called
   a. Accommodation
   b. Assimilation
   c. Equilibrium
   d. Schemas
   e. Nodes

6. According to Piaget's theory, we develop schemas
   a. During gestation
   b. Through experience
   c. Via instinct
   d. During adulthood
   e. During adolescence

7. The rooting reflex is a neonate's tendency to
   a. Open its mouth and turn its head when touched on the cheek

b. Throw out its arms and legs and quickly retract them when startled
c. Explore the world through sucking objects
d. Look longer at round shapes that look like faces than square shapes that do not
e. Grasp nearby objects

8. In Piaget's concrete operational stage, a child acquires an understanding of the principle of _____.
   a. Conservation
   b. Abstract thinking
   c. Attachment
   d. Object permanence
   e. Separation anxiety

9. The process of conservation refers to a child's ability to
   a. Remember his name
   b. Recognize his mother
   c. Understand a basic law of physics
   d. Know the structure of language
   e. Recognize absurdities in language

10. A time when certain events must take place to facilitate proper development is called the _____ period.
    a. Conservation
    b. Preoperational
    c. Attachment
    d. Critical
    e. Assimilation

11. The sensorimotor stage of cognitive development is one during which children do NOT have the ability to
    a. Respond to the environment
    b. Use simple motor skills
    c. Engage in imaginative play
    d. Smile
    e. Respond to mother's voice

12. Most prenatal influences on humans are genetic or hormonal in origin except for
    a. Teratogens
    b. Stress on the mother
    c. Parents' level of education about fetal development
    d. Family history of mental illness
    e. Operant conditioning occurring before birth

13. Harlow's experiments with substitute mothers made of wire demonstrated the importance of what aspect of nurturing?
    a. Feeding
    b. Responsiveness to needs
    c. Imprinting
    d. Touch
    e. Stranger anxiety

14. In the nature-nurture debate, to which of the following does the "nature" refer?
    a. Critical periods
    b. Imprinting
    c. Environmental factors
    d. Hereditary factors
    e. Traits

15. Eleanor Maccoby's research found which of the following factors to be the *least* positively correlated with problem behavior in preschool children?
    a. Parent income
    b. Parent educational level
    c. Time spent in day care
    d. Child's temperament
    e. Parent sensitivity

16. A child has a dog and refers to this dog as "doggie." She then sees a kitten for the first time and calls out "doggie!" This process is called
    a. Evolution
    b. Formalization
    c. Spreading activation
    d. Accommodation
    e. Assimilation

17. According to Erikson's theory, adolescents are most primarily concerned in a search for
    a. Career
    b. Identity
    c. Affection
    d. Autonomy
    e. Archetypes

18. Mr. Hernandez explains to his son that the speed limit is 55 mph. he tells him to stay under the speed limit when driving because it's the law and will probably prevent accidents. Kohlberg's level of morality illustrated by this example is
    a. Preconventional
    b. Concrete operational

c. Conventional
d. Egocentric
e. Postconventional

19. At which period of prenatal development is it most dangerous for a woman to take in substances that have an impact on a developing fetus?
    a. Nine months
    b. First two months
    c. Third trimester
    d. Second trimester
    e. Sixth month

20. Which of the following is the correct term for a mental rule Piaget said we use to interpret our environment?
    a. Schema
    b. Syllogism
    c. Assimilation
    d. Accommodation
    e. Hypothesis

Schools 4 & 5 – 'Preferred' Unit: Development Post-Test

1. Which of the following is a similarity between the cognitive developmental theory of Piaget and the moral development theory of Kohlberg?
    a. Both theories stress the importance of changes in thinking in their stages
    b. Both believe personality is formed in the first 5 years
    c. Both theories stress the importance of the third stage in the developmental process
    d. Both developed a life span theory and had eight stages
    e. Both believe that libido fixated in childhood cannot be changed

2. Most adolescents can ponder and debate human nature, good and evil, truth and justice. According to Piaget this is due to the emergence of which stage?
    a. Concrete operational
    b. Sensorimotor
    c. Preoperational
    d. Formal operational
    e. Accommodation

3. Danny understands that a tall beaker and a short beaker hold the same amount of water. Danny is demonstrating an understanding of _____.

a. Object permanence
b. Conservation
c. Assimilation
d. Accommodation
e. Critical periods

4. According to Erikson, _____ is a key task of adolescence.
   a. Experimenting with sex and drugs
   b. Searching for identity
   c. Learning to reason abstractly
   d. Establishing intimacy
   e. Experiencing generativity

5. Most prenatal influences on humans are genetic or hormonal in origin except for
   a. Teratogens
   b. Stress on the mother
   c. Parents' level of education about fetal development
   d. Family history of mental illness
   e. Operant conditioning occurring before birth

6. According to Diana Baumrind, which of the following parental styles results in the most socially competent and responsible adults?
   a. Authoritarian
   b. Authoritative
   c. Uninvolved
   d. Permissive
   e. Indulgent

7. Researchers suggest that infancy's major social achievement is attachment. *Childhood's* major social achievement is developing
   a. Basic trust
   b. Into a sexually mature person
   c. Intimacy
   d. A positive sense of self
   e. Object permanence

8. According to Erickson's psychosocial theory of development, the crisis that needs resolution for adolescents involves the search for
   a. Trust
   b. Identity
   c. Autonomy
   d. Initiative
   e. Worth

9. A researcher asks elementary, junior high, senior high, and college students to define the term "cheating," and analyzes differences in their definitions across age groups. This is an example of which type of study?
    a. Longitudinal
    b. Sequential
    c. Cross-sectional
    d. Case study
    e. Observational

10. The loss of brain cells, the deterioration of neurons that produce acetylcholine, and the formation of plaques at the ends of neuron branches is indicative of
    a. The death-deferral phenomenon
    b. Alzheimer's disease
    c. Crystallized intelligence
    d. Multiple sclerosis
    e. Normal aging

11. The Harlow studies of attachment in monkeys concluded that _____.
    a. Food was the monkeys' greatest motivator
    b. Contact was preferred by the monkeys
    c. Loneliness was experienced by monkeys that were without playmates
    d. Imprinting matters more than attachment
    e. The temperature of the test rooms was the most important variable

12. In which stage of cognitive development do infants learn object permanence?
    a. Preoperational
    b. Formal-operations
    c. Autonomy
    d. Sensorimotor
    e. Conventional

13. Temperament refers to an infant's
    a. Susceptibility to infection and disease
    b. Emotional reactivity
    c. General intelligence
    d. Level of anger
    e. Ability to learn from situations

14. What is the main reason a child can be born addicted to drugs?
    a. The mother uses drugs and it crosses the placenta into the child's bloodstream
    b. The hereditary trait for addiction is manifested in utero
    c. The fetus' chromosomes are not fully developed until birth
    d. Personality traits, such as addiction, are evident in birth
    e. A child is not capable of being born addicted to drugs

15. Keisha was able to roll over at two months, crawl at five months, and walk at ten months. This sequence of development is most likely due to
    a. Egocentrism
    b. Social context
    c. Maturation
    d. Attachment
    e. Assimilation

16. According to Piaget, egocentrism is most characteristic of the _____ stage of cognitive development
    a. Sensorimotor
    b. Preoperational
    c. Concrete operational
    d. Formal operational
    e. Assimilation

17. A researcher dabs color on a 16-month child's face and places the child in front of a mirror. Which of the following developmental milestones has been reached if the child realizes that there is something wrong with its face?
    a. Visual discrimination
    b. Recognition of a human form
    c. Recognition of self
    d. Identification of the gender of the image
    e. Perception of the image as a playmate

18. Some researchers consider developmental psychology an applied research topic because
    a. It is more easily applied to people's lives than research such as behaviorism
    b. Researchers apply findings and theories from other areas of psychology to the specific topic of human development
    c. It is more commonly studied by a graduate students rather than an undergraduate because of the applications for other research
    d. Doing original research in this area is difficult, so most of the research is about application
    e. Pure research is difficult to gain support for, especially when a researcher needs to recruit children as participants

19. Which Piagetian stage of cognitive development is characterized by mastery of conservation tasks?
    a. Sensorimotor
    b. Preoperational
    c. Concrete operations
    d. Formal operations

e. Tertiary circular reactions

20. According to Kohlberg, what kind of morality is exhibited when actions are judged "right" because they flow from society's basic ethical principles?
    a. Preconventional
    b. Conventional
    c. Formal operational
    d. Postconventional
    e. Preoperational

Appendix C – Student Survey

Student Survey

1. Please identify your current grade level: 10 11 12

2. Please list the math classes you have taken in high school.

3. Have you taken a psychology course prior to AP Psychology?

   Circle one: Yes No

4. What other AP classes have you taken? Please list.

5. What AP Exams have you taken? Please list.

6. Are you enrolled in other AP classes? If so, which ones?

7. For which AP classes do you plan to take an AP Exam?

Appendix D – Unit Descriptions

In the AP Psychology Instruction Manual for Teachers (2008a), teachers are given specific directions regarding the content for each unit of instruction. Below is a list of descriptions for each of the teachers' 'Preferred' units:

School 1: Content Coverage for Social Psychology Unit

> Your students should understand how groups and individuals affect group and individual behavior. Focus on social cognition, including attribution theory, and discuss the fundamental attribution error in the context of an example like the mass suicide at Jonestown in 1978. Discuss how attitudes are formed and if/how they can be changed; you can illustrate attitude change by showing the clip on the Stanford Prison experiment from "The Power of the Situation" in the Discovering Psychology series. Ask your students to consider the ways in which stereotypes affect our attributions and how prejudice develops, and expose them to classic studies on social influence, including those on conformity, compliance, obedience, and altruism. Students may also enjoy discussing the ethical questions raised by Milgram's study on obedience to authority figures. His classic study has been recreated with fascinating results in "The Milgram Experiment Revisited," part 5 in the Primetime: Basic Instincts series. Students should also understand aggression and how conflict between groups develops. Help them focus on ways to increase cooperation among members of different groups, including groups in organizations (College Board, 2008a, p. 9).

School 2: Content Coverage for Learning Unit

> Students need to be able to distinguish between classical conditioning (Pavlovian conditioning), operant conditioning (instrumental conditioning), and observational learning (modeling). Discuss with them the concepts of acquisition, extinction, spontaneous recovery, generalization, discrimination, contingency, and contiguity as they apply to both classical and operant conditioning. It is helpful to use historical examples like Pavlov's dogs or Skinner's pigeons to illustrate these concepts. The use of everyday examples, such as the development of phobias through classical conditioning or the training of a family pet with operant conditioning, may increase students' understanding of these phenomena. When covering operant conditioning, make sure that students understand the concepts of reinforcement and punishment (take care to

highlight the difference between negative reinforcement and punishment). Also, be sure to emphasize schedules of reinforcement. With respect to developments in the field, you should discuss the role of cognition in learning and the importance of understanding the biological predispositions of animals in training (College Board, 2008a, p. 7).

School 3: Content Coverage for Biopsychology Unit

"Understanding the link between biology and behavior is another essential aspect of the study of psychology. You may wish to begin by investigating how researchers have studied the brain, including current brain imaging techniques. It is important to discuss the structures and functions of the different brain regions in addition to the functions of the central and peripheral nervous system. Using case studies of individuals who have suffered central or peripheral nervous system damage may help students personalize the material. In addition to understanding brain structures, students also need to be familiar with the structures and functions of the neuron. Describing how certain drugs act at the synapse or how specific physical conditions or mental disorders are linked to an abundance or deficit of specific neurotransmitters—such as the link between Parkinson's disease and dopamine deficiency—may also increase student interest in this information" (College Board, 2008a, p. 3).

Schools 4 & 5 - Content Coverage for Development Unit

"Help your students understand that development is a lifelong process. Students should consider physical, social, emotional, and cognitive development through conception, gestation, infancy, childhood, adolescence, and adulthood. Contrast the research methods used by psychologists in studying development, including longitudinal and cross-sectional designs, and discuss their advantages and disadvantages. You could give intelligence testing as a salient example of the cohort effect and how it affects cross-sectional designs, or use an example like language development or fetal alcohol syndrome to discuss the role of sensitive (critical) periods during early development. Students also need to be aware of such major developmental theorists as Piaget, Kohlberg, Gilligan, Erikson, Kübler-Ross, and Vygotsky. Consider having preschool-aged children visit your classroom to demonstrate Piaget's conservation. Ask students to list the pros and cons of cheating to illustrate Kohlberg's stages of moral development (College Board, 2008a, p. 8).